UNITED STATES DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

ANIMAL HUSBANDRY RESEARCH DIVISION

and

COOPERATING SOUTHERN STATES

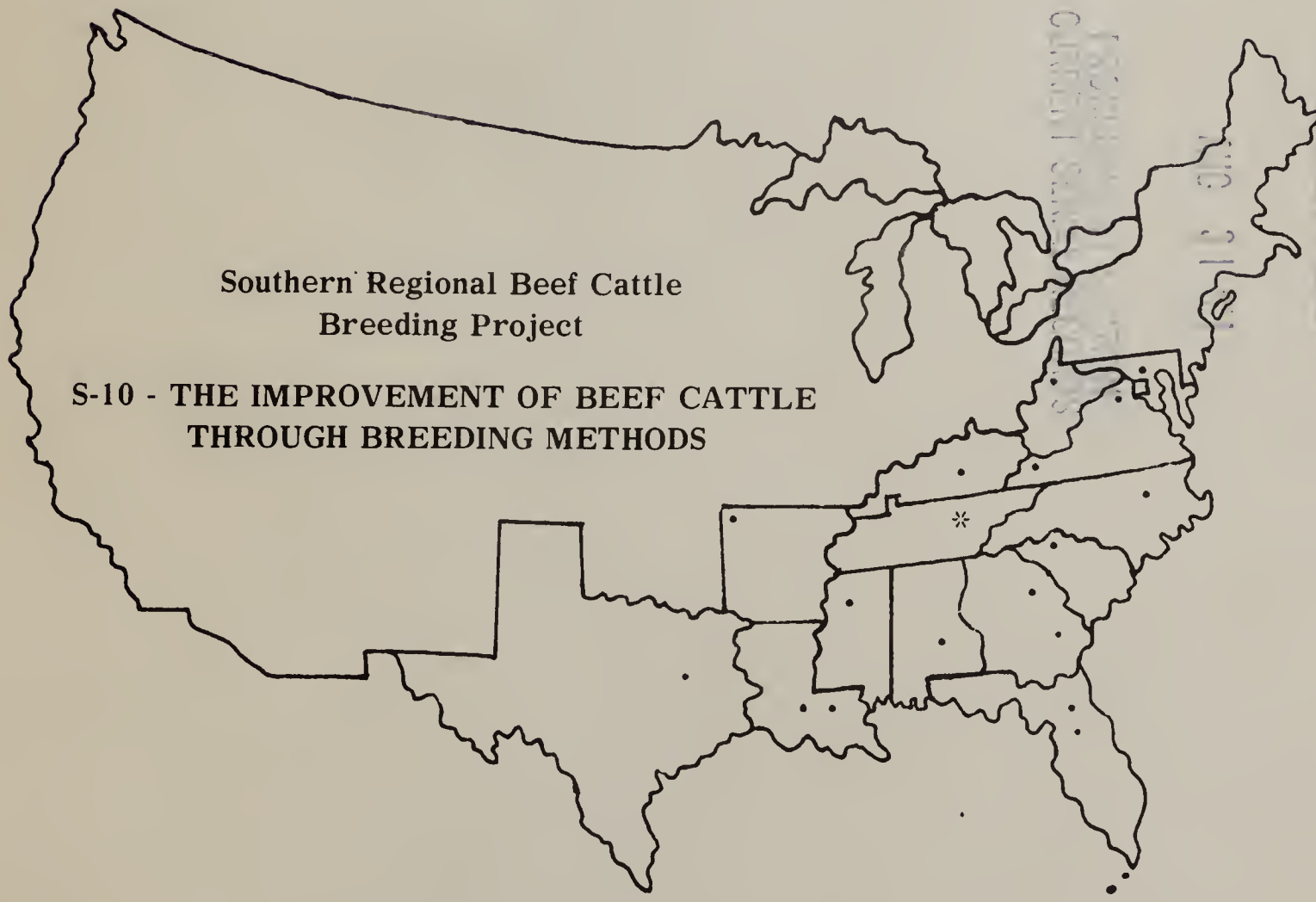
# 1963-1964 Annual Report of S-10

# and

# Report of Annual Technical Committee Meeting

# State College, Mississippi

# June 21, 24, 1964






This report is intended for the use of administrative leaders and workers and is not for general publication.

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# INTRODUCTION

This project was initiated in 1948 to investigate and develop methods of breeding more productive beef cattle for the South. Detailed annual reports showing research developments and progress in each state have been prepared each year since 1950. Complete results of certain phases of the project have been reported in a regional bulletin on crossbreeding and in several technical articles and bulletins published by workers in the various states which contribute to the S-10 project.

This publication includes the proceedings of the 1964 annual meeting of the S-10 Technical Committee and the annual reports of projects in each of the 13 contributing states. The annual reports of S-10 contributing and supporting projects were prepared by the project leaders and other personnel at the various stations as summaries of the research developments and progress at each station during 1963. The results are not considered final, but the material will aid cooperators and the Regional Coordinator in developing an integrated program. This report also provides information needed by heads of animal husbandry departments, experiment station directors, and U. S. Department of Agriculture officials for evaluation of the projects with respect to objectives and procedures. This report is not for general distribution, and material contained in it should not be quoted in publications.

## Scope of the Project and Recent Developments

Projects from 13 states and the Animal Husbandry Research Division of the Agricultural Research Service, U. S.Department of Agriculture, contributed to the Southern Regional Beef Cattle Breeding Project, S-10, in 1964. Experiments were conducted at 32 experiment stations in the 13 states and at three federally-owned experiment stations located at Brooksville, Florida; Jeanerette, Louisiana; and Front Royal, Virginia. These three USDA stations are operated cooperatively with the state in which they are located.

A total of 12,701 beef cattle were inventoried on July 1, 1964, in research herds at the contributing experiment stations. This is a decrease from last year, due to the revision of some of the state projects. Approximately 10,250 head of cattle contributed directly to the S-10 project, while the remaining cattle were used simultaneously in other projects. The total number of cattle includes 6022 cows two years and over, 1477 yearling heifers, 2203 bulls and steers under one year of age, 2138 heifers under one year of age, 567 bulls over one year of age, and 294 steers over one year of age.

Detailed review of the work in several of the states has been made during the past year, resulting in revision of some of the contributing efforts. The project at the Iberia Livestock Experiment Station at Jeanerette, Louisiana, has been revised to investigate selection for changes in leanness in Angus and Brangus cattle. The objective of this study will be to determine

if changes in leanness can be made by selection in opposite directions for fatness, as measured by ultrasonics. An additional study of the response to selection for adaptability in the Gulf Coast area, using Angus cattle, has been designed.

A revision of part of the project at the West Central Florida Experiment Station at Brooksville, Florida, has been made to include investigation of the natural reproductive habits of Brahman and Santa Gertrudis cattle. The objective of this study will be to compare the reproductive and weaning performance of Brahman and Santa Gertrudis cows bred during a three-month season with those bred on a year-round basis.

A portion of the contributing project from the Alabama station is being studied for a revision to allow selection for carcass traits in the Angus and Hereford breeds.

A new project designed to investigate basic beef cattle genetics, including the genetics of qualitative characters and cytogenetics of beef cattle, has been initiated at the Texas Agricultural Experiment Station.

Data collected through the S-10 regional project on fertility of beef cattle in the South, along with other studies from the contributing states involving beef cattle reproduction and calf losses, are being incorporated into a regional publication.

Two studies involving rather large amounts of cooperative data are now in progress. The first study involves the influence of mature cow size on calf production. This study will investigate sources of variation that may have some importance in the economic production of beef cattle in the South. The second study involves the selection of beef cows on the basis of their past reproductive performance.

Data are continually being collected in the Region on the study of crossbreeding and subsequent crosses after the single cross. Experiments on inbreeding and selection are being continued at several stations. Development of more precise methods of beef cattle improvement, with respect to performance characteristics, efficiency, milking ability and cow productivity, adaptation to environmental conditions, and quality of meat, is receiving continued effort throughout the Region.

## Research Results During the Year

The research results in the S-10 project are cumulative and are of a continuing nature, since the beef cattle breeding projects cover a period of several years. The chief accomplishments and results of a more or less specific nature are as follows.

During the past year, 5165 cows were exposed to bulls on S-10 contributing projects. This is slightly less than the 5584 which were exposed last year.

Of this number, 81 percent gave birth to calves, while 73 percent weaned live calves. Approximately 90 percent of the calves born were weaned, indicating that calf death losses (dead at birth and dead up to weaning) amounted to about 10 percent. The average weaning percentage for purebred matings was greatest for Angus, followed very closely by Hereford, Charolais, Brangus, Santa Gertrudis, and Brahman. Weaning percentages for crossbred matings were higher than for the purebred matings. Average daily gain up to weaning was: Angus, 1.8 lbs.; Hereford, 1.6 lbs.; Shorthorn, 1.6 lbs.; Brahman, 1.9 lbs.; Brangus, 1.6 lbs.; Charolais, 1.7 lbs.; and Santa Gertrudis, 1.9 lbs.

Data from the Louisiana station, collected from 1953 through 1962, were analyzed to determine the effect of breed of dam, age of dam, time of calving, and weight change during the winter upon conception rate during the subsequent breeding season. It is evident that crossbreeding results in considerable improvement in mean conception rate. Wide crosses are superior in conception rate to those crossbred dams resulting from crosses between more closely related breeds. The higher percentage calf crop, coupled with heavier weaning weights of calves, gives crossbred cows a substantial advantage over purebred cows in pounds of calf weaned per cow bred. These analyses revealed that cows calving early in the season are more likely to conceive during the subsequent breeding season. The 90-day calving season was divided into three 30-day periods for the purpose of analysis. Least squares estimates for conception rate were 84, 77, and 71 percent for cows calving during the first, second, and third periods, respectively. Cows which were dry during the breeding season had a conception rate of 68 percent. Confirming earlier results from other experiments, these data reveal strong evidence that there is an interaction between breed of dam and lactation status, with respect to calving percentage. Dry British and crossbred cows, apparently, were less likely to conceive than those which were nursing a calf when bred. On the other hand, Brahman cows which were dry during the breeding season had a higher conception rate than did Brahman cows nursing a calf.

A study involving the exposure of 11 open, lactating cows to bulls for 74 days was conducted at the Iberia Livestock Experiment Station in an attempt to determine why cows do not settle during the breeding season. The calves were weaned 32 days after the bulls were put in with the cows, and the cows were slaughtered 25 days after the 74-day breeding season. Two cows failed to come into heat while nursing a calf, and only one-third of the cows showing heat conceived while nursing a calf. One cow still did not show heat after the calves were weaned. Cows in medium to good condition had a much higher pregnancy rate for the entire study than cows that were thin. In a similar study at the South Carolina station, 20 cows which were exposed during the breeding season but were open, as determined by pregnancy check, were checked twice daily for visual signs of estrus and twice weekly by rectal palpation for a 10-week period. Cows showing visual signs of estrus were bred by artificial insemination. All of the cows cycled during the 10-week period, as determined by rectal palpation. Of 18 cows that showed visual signs of estrus and were bred artificially, eight were diagnosed pregnant.

A study on cow and calf weights at the Texas station, involving a large amount of data from Hereford, Brahman, and Hereford-Brahman crosses, indicated that there was a rather uniform increase in average calf weight as dam weight increased up to 1050 pounds, a leveling-off of calf weights when dam weights increased from 1050 to 1300 pounds, and a decrease in calf weights as cow weights increased up to 1350 pounds. It appears that selection for weaning weight would be more efficient if dam weight were taken intc consideration. Analysis of cow weights taken either 30 to 60 days before, 60 to 90 davs after, or 180 to 210 days after calving indicated that year effects had more influence on cow weights taken when their calves were old enough to be weaned - 180 to 210 days - than when calves were younger. Month of birth was apparently a more important consideration for cow weights taken 60 to 90 days after calving than at either of the other two times. The other effects studied - including breed or cross, previous parity, age of cow, sex of calf, weight of calf, age of calf, and weight of dam - were similar for the analysis on cow weights taken at 30 to 60 days before, 60 to 90 days after, or 180 to 210 days after calving. Analysis of calf weights was just as efficient when either weight of dam was deleted or age of dam was reduced to only two categories - first-calf heifers and older cows. In addition, the state of parity of dam the previous year did not contribute significantly.

Yield and composition of milk were estimated for 16 groups of cows in nine herds in the Texas Experiment Station system. Most of these cows were milked only one time at an average of 17 hours after the nurse-out. Angus, Brahman, Brahman x Hereford crossbreds, Charbray, Hereford, Santa Gertrudis, and Shorthorn cows were involved. The mean yield for 362 cows, corrected to a 24-hour basis was 11.5 lbs. Large variation was found in individual milk yield within herds, breeds, and crosses. Percent butterfat was also widely variable, but percent solids not fat was quite stable under all circumstances. Milk yield was definitely related to age of cow, but the data are considered biased in favor of the older groups because of culling level, which may differ by herds. Weight of cow did not significantly effect either milk yield or composition. Breed and cross influenced both yield and composition of milk. The effect of heterosis in Brahman x Hereford first-cross cows was clearly manifested in milk yield, which was reflected in calf weaning weight. Percent composition of milk had little, if any, effect on calf weight, although there was a closer relationship between yield of milk solids and calf weight. Calves self-fed hay and hand-fed milk from birth to 205 days of age at levels of 5, 7, and 10 percent of body weight per day showed significant differences in weight gained, weight per day of age, and 205-day weaning weight. As milk composition increased, the weights increased. Levels of butterfat (3, 4, and 5 percent) in the milk fed at a level of 10 percent of body weight per day did not significantly affect calf growth. Flesh of calves at weaning appeared to be related to level of milk intake, but not to level of butterfat in the milk. Milk production definitely appears to be a useful aid in selection, and satisfactory methods for estimating milk production have been developed.

Additional data from several stations have shown that environmental effects have different influences on different breeds and at different locations, as far as growth rate is concerned. Data collected in 111 Angus and 82 Hereford

herds in the Virginia BCIA program during 1957 through 1962 indicated that new estimates of the effects of age, sex, month of birth, year, management practice, and age of dam on calf performance agreed fairly well with those reported earlier by both the Virginia station and other stations. All factors studied had a significant influence on preweaning gains and grades. Results from this study also indicate that either little selection was made for milking ability or selection was not very effective in these herds during the period studied. Heritabilities of preweaning grade and index were estimated from records on 12,145 Angus calves by 596 sires and 8279 Hereford calves by 420 sires by the half-sib method. The heritability estimates for average daily gain for Angus bulls, steers, and heifers were 0.49, 0.43, and 0.31, respectively. For Hereford bulls, steers, and heifers they were 0.33, 0.27, and 0.31, respectively. Heritability estimates for grade for Angus bulls, steers, and heifers were 0.27, 0.37, and 0.39, respectively; and for Hereford bulls, steers, and heifers they were 0.69, 0.19, and 0.33, respectively. Heritability estimates of the index giving equal weight to preweaning average daily gain and grade for Angus bulls, steers, and heifers were 0.30, 0.46, and 0.34, respectively; and for Hereford bulls, steers, and heifers they were 0.34, 0.14, and 0.32, respectively. Genetic and phenotypic correlations between average daily gain and grade were not computed for the individual sexes since the heritability estimates were not significantly different among the sexes. Combined estimates for phenotypic and genetic correlations were 0.28 and 0.28, respectively, for the Angus breed and 0.30 and 0.23 for the Herefords.

A limited amount of data continue to indicate the feasibility of producing thousand-pound calves in a year or less. The goal of producing thousand-pound calves at weaning is probably several generations in the future. However, data from the Texas station show that a group of steers from various breed groups which were managed and fed to gain a maximum amount averaged 963 pounds at 365 days, as compared to 973 pounds last year. Some of the breed groups exceeded 1000 pounds at one year of age.

Data from the crossbreeding experiments continue to indicate the advantages of crossbreeding as a breeding system. A summary of five years of data at the Alabama station indicated that crossbred steers had an advantage of 40 pounds in adjusted weaning weight over purebred steers, a 0.15-pound advantage in average daily gain up to weaning, a 70-pound advantage in chilled carcass weight, and slight advantages in grade over purebred steers. When finished in a uniform feeding period, the crossbred steers were fatter (0.12 of an inch fat thickness over the rib eye), but there was no difference in meatiness or tenderness, as measured by rib eye per 100-pounds of carcass and Warner-Bratzler shear, respectively. The crossbred heifers weaned heavier than purebred heifers. However, there were no differences in postweaning performance between the two breeding groups. Two years' data with limited numbers suggest that crossbred dams are more superior mother cows than are purebred dams.

Additional information from two stations on subsequent crosses after the single cross continue to indicate the advantage of crossbreeding schemes over straight breeding systems. Three years' data from the Louisiana station involving single crosses, back-crosses, three-breed crosses, and straightbreds

indicate that the single crosses are slightly superior to the back-crosses and three-breed crosses in rate of gain on feed, but the back-crosses and three-breed crosses excel the single crosses in adjusted weaning weight at 205 days. This indicates the advantage of the crossbred dam in calf production. The average weaning weight at 205 days for 93 straightbred calves, involving Angus, Brahman, Brangus, and Hereford calves, was 390 pounds, as compared to 155 single cross calves averaging 418 pounds, 195 back-cross calves averaging 459 pounds, and 194 three-breed cross calves averaging averaging 463 pounds. The heavier weaning weights of crossbred calves, coupled with the higher percentage calf crop, gave crossbred cows a substantial advantage over purebred cows in pounds of calf weaned per cow bred. Louisiana data are supported by work at the Virginia station where calves from crossbred dams had a higher daily gain to weaning. This study is designed to breed purebred dams with crossbred bulls and crossbred dams with purebred bulls so that all calves are, thus, either three-breed or backcrosses in all possible combinations of the three breeds - Angus, Hereford, and Shorthorn - involved. This permits an estimate of heterosis in the dams without confounding with heterosis in the calves. In one year's data from the Virginia station, the crossbred dams had a calving percentage born of 97 percent, as compared to 92 percent for the purebred dams, but both the purebred and crossbred dams weaned 88 percent calf crops.

Data from the inbreeding study at the Front Royal, Virginia station where "type" and "growth" data on 2440 calves from birth to weaning were analyzed indicate large differences among lines in response to inbreeding. This is shown by the difference between foundation and inbred lines for birth and mid-summer weights, gain to weaning, and weaning type score. Weights and gains of the calves from the "growth" herd exceeded those of the "type" calves and, conversely, "type" calves had higher conformation than did "growth" calves. Response to inbreeding of calf and of dam was nearly opposite in Angus and Shorthorn calves. For example, in Angus each additional 1 percent inbreeding of the calf decreased average daily gain to weaning by -.0056 pounds, whereas, in Shorthorns the value was -.0031 pounds. In contrast, similar regressions on percent inbreeding of the dam were -.0012 pounds for Angus and -.0047 pounds for Shorthorns.

Studies of carcass and meat characteristics in relation to genetic aspects of beef cattle improvement are continuing at several stations. In a study estimating total retail value and retail value per hundredweight from weights of retail cuts and calculated values of each cut, carcass composition appeared as important or more important than carcass grade in determining retail value, when the only price differential due to carcass grade was between cuts from carcasses grading low choice and higher and those grading below low choice. In another study at the same station, carcass weight alone accounted for more of the variation in carcass roast and steak meat than any combination of the other carcass variables. An equation containing kidney fat weight and carcass weight accounted for 90 percent of the variation in the dependent variable, while equations containing a measure of fat thickness and carcass weight accounted for over 83 percent of the variation in roast and steak meat. The ease and accuracy with which fat thickness may be determined, in comparison with kidney fat weight, might make the second equation more applicable for general usage.

Partial correlations with carcass weight held constant disclosed significant negative relationships between the measures of carcass fat, kidney fat weight, fat thickness, and either longissimus dorsi area or roast and steak meat. Although partial correlations between l. dorsi area and the weight of the boneless trimmed loin, rib, or round were significantly positive, l. dorsi area was negatively related to the weight of the chuck. A cancelling effect which would partially explain the non-significant relationship between l. dorsi area and the weight of the roast and steak meat when carcass weight was held constant is suggested.

Additional information has been gathered during the past year in an effort to determine whether the use of ultrasonics as a tool in live animal carcass evaluation is feasible. In recent cooperative work between the Agricultural Research Service and the University of Tennessee, correlations between ultrasonically estimated rib-eye area and carcass rib-eye area was 0.61 for a group of 25 heifers. Correlation between ultrasonically estimated fat thickness and carcass fat thickness was 0.69 for this same group of heifers. The ultrasonic estimates were based on the average of three interpreters. The correlation between carcass fat thickness and estimated percent separable lean in the carcass (estimated by a formula) was a negative 0.99. Correlations between ultrasonically estimated fat thickness and the estimated percent separable lean in the carcass was a negative 0.64. These relationships indicate that the animals with less fat thickness between the 12th and 13th rib had a higher proportion of separable lean. Even though the correlations between the estimated fat thickness and estimated percent separable lean were not as high as we might like, they do indicate that this might be a useful tool in animal evaluation. One operator in this study estimated 60 percent of the heifers within 1 square inch of the actual rib-eye area, and 90 percent were estimated within 2 square inches. This particular operator did not miss any of the actual rib-eye areas more than 2.5 square inches. In addition, 80 percent of the fat thickness estimates were within 0.1 of an inch of the carcass measurements and all fat thickness measurements were within 0.2 of an inch. The rib-eye areas for these heifers varied from 9.4 square inches to 13.4 square inches and fat thickness varied from 0.2 to 0.8 inches.

In a cooperative study at the University of Arkansas this past year, two people interpreted the somagrams of 20 bulls weighing 700 pounds and over, which were later slaughtered. Correlations between estimated rib-eye area and carcass rib-eye area were 0.79 for one operator and 0.80 for the other. Fat thickness correlations were 0.90 for the first operator and 0.86 for the second operator. In this study, neither of the operators missed any of the rib-eye areas more than 0.3 of a square inch. In fact, on fat thickness both operators estimated 80 percent of the cattle within 0.1 of an inch.

In a study at the North Carolina station where bulls are slaughtered and organoleptic data taken, some undesirable flavors have been detected in some of the bull carcasses in previous years. During the past year, steaks were sampled by an expert taste panel at 5 to 8 days after slaughter, after 4.5 months of

storage, and after approximately 8 months of storage. Off-flavors were essentially absent in all tests. Therefore, aging does not appear to have caused so many off-flavor steaks in previous years. Further investigation is planned in this area.

Two experiments devoted to the study of genetic-environemtnal interactions are continuing in the Southern Region. Both of these studies are relatively new, and few results have been analyzed. However, data on 104 steers from the North Carolina station, slaughtered in 1962 and 1963, were analyzed for indications of genetic-environmental interactions. Twenty-five items relative to live-weight carcass measurements and cooked steaks were considered in the analyses. Main effects, i.e. location, ration, sire, and year, were significant for most carcass measurements, and ration significantly affected taste panel scores for juiciness and flavor. Interaction between ration and year was significant for percent dress, marbling score, and carcass grade. The only indication of a genetic-environmental interaction was in percent separable lean in the 9-10-11th rib cut. Heifers which are progeny of sires used in this project are calving for the first time in 1964, and data on cow performance will soon be available for further consideration of interactions.

The genetic-enviro nmental interaction study at Brooksville, Florida, which is an inter-regional cooperative study between that station and Miles City, Montana, is now in its third year. Adaptation of cattle from one station to the other has been relatively good, although some differences in shedding of hair, growth rate of calves, and fertility of cows has been noticed.

A study of Snorter dwarfism, as well as of other types of dwarf anomalies in beef cattle, is being continued at the Florida experiment station. Dwarf x dwarf, dwarf x carrier, dwarf x normal, and normal x normal matings have been made in order to study the biochemical abnormalities in body fluids and tissues which may serve to identify carriers of the dwarfism trait. Embryos have been removed at 40, 60, and 90 days of age and the cows returned to the breeding herd to be bred again. This is an attempt to bracket the stage of development when the dwarf gene action is apparent. At present, 18 embryos of varying ages have been recovered and are being studied. Techniques are still being perfected for the culture of bovine leucocytes for cytogenic studies. Dwarfism research is being continued at the Tennessee station in a limited way. Known dwarf tester cows have been assembled and are being used to check herd sire prospects for possible dwarf genes. A Snorter dwarf Angus heifer, 36 percent inbred, was born in 1963 at the Front Royal, Virginia station in one of the Angus inbred lines. There was no previous history of Snorter dwarfism, as far as can be determined from available pedigree information, in this line at that station; however, the dwarf's grandsire was reported to have produced dwarfs in artificial use by the Virginia Artificial Breeders Association. An effort is being made to detect the possible path by which the gene entered the line.

Performance test information is being gathered in the experiment station herds of virtually all states. In several instances, sires are progeny tested before they are used extensively in selection herds. At the Alabama station, a total of twelve 140-day postweaning performance tests have been completed.

During the first 10 years, a total of 517 bulls completed the test with an average daily gain of 2.24 pounds and a weight per day of age of 2.06 pounds; while during the last two years, 139 bulls completed the test with an average daily gain of 2.42 pounds and a weight per day of age of 2.29 pounds. The top third of the bulls gained an average of 2.73 pounds daily during the last four years, as compared to the lowest third which gained 2.14 pounds daily. These bulls brought an average sale price of $775.00 and $475.00, respectively. Weight per day of age was also evidently considered in buying bulls, since the top third, with a weight per day of age of 2.46 pounds, brought an average of $767.00 per head, as compared with 2.09 pounds and $482.00 per head for the lower third. At the Tennessee station, two methods of developing and testing herd bulls from weaning to approximately 20 months of age are being compared. During the past year, 41 Hereford and Angus bulls from various Tennessee sub-stations were used in this experiment. Representative bulls from each method will be progeny tested on random groups of cows to determine which method serves as a better indicator of the progeny's growing ability.

## Future Plans

As related in this report last year, the S-10 Technical Committee has undertaken a revision of the S-10 project. This revision is now in its final stages of completion. Even though this revision is in progress, work will continue along the lines of selection, breeding systems, beef quality and carcass work, studies of genetic abnormalities, and projects of related interest. Since the revision of the S-10 project incorporates some changes in objectives and goals, some of the contributing states are also contemplating revisions at this time.

## Public Interest in the Program

Data from the S-10 Regional Beef Cattle Breeding Project have been used in various phases of beef cattle production in the South. Information arising from this project has been utilized in approximately 53 field days and 30 popular articles during the past year. An estimated 105 talks have been given relating information from this project to the public. A recent survey indicates that there are over 2336 herds on production-testing programs in the Southern United States, involving over 183,550 head of breeding cows. Information on approximately 156,760 head of calves was related to the owners for use in herd improvement. There were 4005 sires evaluated by progeny testing on state production testing programs. Of these, 1933 were evaluated in on-the-farm performance tests and 3224 were evaluated in central bull testing facilities in operation during the past year. Seven states reported sales in connection with their central bull tests, while at least eight states have sales in which performance tested bulls - although not always tested in central bull tests - have been sold. Prices of performance-tested bulls were quite variable, but in most instances these prices were related to the performance of the bulls.

TABLE 1. Cattle Inventory and Percent Used in S-10 Contributing Projects July 1, 1964

| State | Cows two years and over | Yearling heifers | Bulls and steers under one yr. | Heifers under one yr. | Bulls over one yr. | Steers over one yr. | Total number | Percent used in project |
|---|---|---|---|---|---|---|---|---|
| Alabama | 410 | 50 | 156 | 142 | 36 | 14 | 808 | 100 |
| Arkansas | 310 | 116 | 67 | 52 | 119 | - | 664 | 100 |
| Florida | 30 | 6 | - | 9 | 4 | - | 49 | 100 |
| Georgia | 633 | 126 | 263 | 262 | 32 | 52 | 1368 | 93.6 |
| Kentucky | 200 | 26 | 79 | 79 | 25 | - | 409 | 100 |
| Louisiana | 399 | 104 | 139 | 138 | 20 | 3 | 803 | 100 |
| Mississippi | 697 | 125 | 261 | 267 | 29 | 111 | 1490 | 57.2 |
| North Carolina | 283 | 95 | 80 | 107 | 8 | 61 | 634 | 90.1 |
| South Carolina | 213 | 50 | 66 | 87 | 22 | - | 438 | 50 |
| Tennessee | 1058 | 196 | 363 | 350 | 31 | 21 | 2019 | 100 |
| Texas | 398 | 150 | 128 | 150 | 45 | - | 871 | 100 |
| Virginia | 170 | 9 | 176 | 49 | 15 | - | 419 | 100 |
| West Virginia | 161 | 97 | 71 | 72 | 12 | 32 | 445 | 0 |
| Total | 4962 | 1150 | 1849 | 1764 | 398 | 294 | 10411 | |
| Federal-State Cooperative Stations: | | | | | | | | |
| Brooksville, Florida | 394 | 88 | 115 | 127 | 72 | - | 796 | 100 |
| Jeanerette, Louisiana | 271 | 126 | 90 | 116 | 52 | - | 655 | 100 |
| Front Royal, Virginia | 395 | 113 | 149 | 131 | 45 | - | 833 | 100 |
| Total | 1060 | 327 | 354 | 374 | 169 | - | 2284 | |
| Total | 6022 | 1477 | 2203 | 2138 | 567 | 294 | 12701 | |

TABLE 2. Regional Research and Animal Husbandry Research Division Funds Expended on Beef Cattle Breeding Work During the Fiscal Year Ending June 30, 1964

| State | Regional research funds | AHRD funds |
|---|---|---|
| Alabama | 19,830.00 | 2,400.00 |
| Arkansas | 12,000.00 | 3,000.00 |
| Florida | 3,295.80 | 2,500.00 |
| Georgia | 6,250.00 | 4,940.00 |
| Kentucky | 10,800.00 | |
| Louisiana | 7,000.00 | |
| Mississippi | 8,000.00 | 2,400.00 |
| North Carolina | 11,000.00 | 1,800.00 |
| South Carolina | | |
| Tennessee | 12,000.00 | 9,400.00 |
| Texas | 15,423.00 | 8,200.00 |
| Virginia | 15,000.00 | 14,100.00 |
| West Virginia | | |
| Total | 120,598.80 | 48,740.00 |

TABLE 3. Summary of Cow Performance for S-10 Herds by Breed for 1963

| Breed | Total number exposed | No. of calves born | No. of calves weaned | Percent calving B/E | Weaning percent W/E | Percent raised W/B | Av. birth weight | Adj. ADG | Av. type score |
|---|---|---|---|---|---|---|---|---|---|
| Angus[1] | 1272 | 1035 | 928 | 81.37 | 72.96 | 89.66 | 61.49 | 1.77 | 11.8 |
| Hereford | 2102 | 1722 | 1532 | 81.92 | 72.88 | 88.97 | 68.80 | 1.65 | 11.1 |
| Shorthorn | 218 | 153 | 126 | 70.18 | 57.80 | 82.35 | 67.85 | 1.60 | 11.7 |
| Africander-Angus | 32 | 21 | 21 | 65.63 | 65.63 | 100.00 | 71.00 | 1.47 | 8.0 |
| Brahman | 116 | 78 | 66 | 67.24 | 56.90 | 84.62 | 63.52 | 1.80 | 10.3 |
| Brangus | 27 | 19 | 18 | 70.37 | 66.67 | 94.74 | 68.58 | 1.62 | 10.6 |
| Charbray | 3 | 2 | 2 | 66.67 | 66.67 | 100.00 | 85.00 | 2.65 | - |
| Charolais | 14 | 11 | 10 | 78.57 | 71.43 | 90.91 | 67.80 | 1.72 | 11.1 |
| Santa Gertrudis | 80 | 56 | 51 | 70.00 | 63.57 | 91.07 | 71.57 | 1.94 | 10.3 |
| Angus x straightbred | 38 | 32 | 30 | 84.21 | 78.95 | 93.75 | 63.58 | 1.62 | 11.4 |
| Hereford x straightbred | 26 | 24 | 24 | 92.31 | 92.31 | 100.00 | 69.45 | 1.60 | 12.2 |
| Shorthorn x straightbred | 29 | 27 | 23 | 93.10 | 79.31 | 85.19 | 61.27 | 1.56 | 11.4 |
| Brahman x straightbred | 14 | 10 | 10 | 71.43 | 71.43 | 100.00 | 74.00 | 1.80 | 10.8 |
| Angus x 2-breed cross | 220 | 189 | 181 | 85.91 | 82.27 | 95.77 | 58.70 | 1.68 | 11.8 |
| Hereford x 2-breed cross | 133 | 104 | 103 | 78.20 | 77.44 | 99.04 | 66.79 | 1.66 | 12.1 |
| Shorthorn x 2-breed cross | 67 | 61 | 58 | 91.04 | 86.57 | 95.08 | 69.13 | 1.57 | 11.6 |
| Brahman x 2-breed cross | 93 | 62 | 56 | 66.67 | 60.22 | 90.32 | 75.43 | 1.94 | 9.9 |
| SG x 2-breed cross | 65 | 54 | 48 | 83.08 | 73.85 | 88.89 | 76.13 | 2.26 | - |
| Crossbreds | 616 | 516 | 477 | 83.66 | 77.44 | 92.44 | 70.94 | 1.88 | 11.1 |
| Average or total | 5165 | 4176 | 3764 | 80.85 | 72.88 | 90.13 | 66.77 | 1.73 | 11.3 |

[1]Does not include cattle from Ames Plantation, Tennessee.

TABLE 4. Summary of Cow Performance for S-10 Herds by States and Federal Stations for 1963

| State or station | Total number exposed | No. of calves born | Calving percent | No. of calves weaned | Weaning percent W/E | Percent raised W/B | Av. birth weight | Adj. ADG | Av. type score |
|---|---|---|---|---|---|---|---|---|---|
| Alabama | 383 | 318 | 83.02 | 304 | 79.37 | 95.60 | 60.29 | 1.62 | 12.1 |
| Arkansas | 341 | 313 | 91.79 | 281 | 82.40 | 89.78 | 62.73 | 1.57 | 11.9 |
| Georgia | 693 | 624 | 90.04 | 585 | 84.42 | 93.75 | 70.25 | 1.56 | 10.8 |
| Kentucky | 67 | 57 | 85.07 | 50 | 74.63 | 87.72 | 59.63 | 1.62 | 12.0 |
| Louisiana | 301 | 223 | 74.09 | 213 | 70.76 | 95.52 | 69.94 | 1.69 | 11.2 |
| Mississippi | 336 | 252 | 75.00 | 228 | 67.86 | 90.48 | 68.35 | 1.70 | 10.7 |
| North Carolina | 247 | 193 | 73.63 | 178 | 72.06 | 97.80 | 67.99 | 1.65 | 9.4 |
| South Carolina | 202 | 173 | 85.64 | 154 | 76.24 | 89.02 | 66.25 | 1.89 | 11.0 |
| Tennessee[1] | 694 | 515 | 74.21 | 447 | 64.41 | 86.80 | 68.41 | 1.84 | 12.2 |
| Texas | 488 | 383 | 78.48 | 341 | 69.88 | 89.03 | 72.21 | 2.38 | - |
| Virginia | 193 | 183 | 94.82 | 173 | 89.64 | 95.54 | 65.40 | 1.65 | 12.0 |
| West Virginia | 178 | 164 | 92.13 | 133 | 74.72 | 81.10 | - | 1.58 | 10.5 |
| Brooksville, Florida | 296 | 236 | 79.73 | 218 | 73.65 | 92.37 | 56.69 | 1.77 | 11.8 |
| Jeanerette, Louisiana | 254 | 173 | 68.11 | 160 | 62.99 | 92.49 | 66.17 | 1.64 | 9.8 |
| Front Royal, Virginia | 492 | 369 | 75.00 | 299 | 60.77 | 81.03 | 66.26 | 1.76 | 12.0 |
| Average or total | 5165 | 4176 | 80.85 | 3764 | 72.88 | 90.13 | 66.77 | 1.73 | 11.3 |

[1]Does not include cattle from Ames Plantation, Tennessee.

PROCEEDINGS
S-10 TECHNICAL COMMITTEE MEETING
State College, Mississippi
June 21-24, 1964

# PROGRAM
# S-10 TECHNICAL COMMITTEE MEETING
# June 21-24, 1964

## June 21

Assemble and register, Alumni Building, Mississippi State University
7:30 p.m. Executive Committee meeting

## June 22

8:00 a.m. Assemble and announcements - T. B. Patterson
8:05 a.m. Introductions - C. E. Lindley
8:15 a.m. Welcome, Predident D. W. Colvard, Mississippi State University
8:30 a.m. Evaluating Inbred and Selection Lines of Beef Cattle - H. H. Stonaker, Colorado State University
9:30 a.m. Resume' of Inbred and Selection Lines at Front Royal, Virginia - K. P. Bovard, Virginia Polytechnic Institute
10:00 a.m. Discussion
10:15 a.m. Analysis of Inbred and Selection Line Data - J. L. Carmon, University of Georgia
11:00 a.m. Discussion
12:00 noon Leave for tour of Prairie (lunch at Mississippi State or on the way) Mississippi Station Report is included during tour
7:00 p.m. Steak Fry - Courtesy of Mississippi Angus Association

## June 23

8:00 a.m. Thirty-minute station reports:
North Carolina - E. U. Dillard
South Carolina - W. C. Godley
Tennessee - C. S. Hobbs
Texas - T. C. Cartwright
Virginia, Blacksburg - T. J. Marlowe
Virginia, Front Royal - K. P. Bovard
12:00 noon Lunch
1:00 p.m. Discussion of S-10 project revision
3:00 p.m. Committee reports:
Data Collection and Analysis - T. B. Patterson
Standardization of Carcass and Meats - C. S. Hobbs
Annual Report Forms - C. J. Brown
3:30 p.m. Tour of the Main Station
6:30 p.m. Dinner - H. H. Leveck, Master of Ceremonies. Physiological Age - H. O. Kunkel, Texas A and M University

## June 24

8:00 a.m. Coordinator's Report - R. S. Temple
9:30 a.m. Discussion
9:45 a.m. Business meeting
12:00 noon Adjourn

S-10 TECHNICAL COMMITTEE MEETING
State College, Mississippi
June 21-24, 1964

The 1964 meeting of the S-10 Technical Committee was held at Mississippi State University, State College, Mississippi, June 21-24 (see program for schedule of events).

Dr. T. B. Patterson, Chairman, called the meeting to order. Dr. D. W. Colvard, President of Mississippi State University, welcomed the group to Mississippi.

Those attending the meetings were:

| Name | Institution | State |
|---|---|---|
| T. B. Patterson* | Auburn University | Auburn, Alabama |
| C. J. Brown* | University of Arkansas | Fayetteville, Arkansas |
| Warren Gifford | University of Arkansas | Fayetteville, Arkansas |
| Marvin Koger* | University of Florida | Gainesville, Florida |
| J. R. Crockett | University of Florida | Gainesville, Florida |
| F. M. Peacock | Range Cattle Exp. Sta. | Ona, Florida |
| W. C. McCormick* | Ga. Coastal Plain Exp. Sta. | Tifton, Georgia |
| T. M. Clyburn | Ga. Coastal Plain Exp. Sta. | Tifton, Georgia |
| R. S. Lowrey | Ga. Coastal Plain Exp. Sta. | Tifton, Georgia |
| J. L. Carmon | University of Georgia | Athens, Georgia |
| N. W. Bradley* | University of Kentucky | Lexington, Kentucky |
| Noah England* | Louisiana State University | Baton Rouge, Louisiana |
| H. D. Chapman | Louisiana State University | Alexandria, Louisiana |
| S. H. Fowler | Louisiana State University | Baton Rouge, Louisiana |
| W. L. Reynolds | Iberia Livestock Exp. Sta. | Jeanerette, Louisiana |
| J. W. High, Jr. | Iberia Livestock Exp. Sta. | Jeanerette, Louisiana |
| T. W. White | Rice Experiment Sta. | Crowley, Louisiana |
| C. E. Lindley* | Mississippi State University | State College, Mississippi |
| B. F. Barrentine | Mississippi State University | State College, Mississippi |
| L. H. Boyd | Mississippi State University | State College, Mississippi |
| B. G. Diggs | Mississippi State University | State College, Mississippi |
| H. H. Leveck | Mississippi State University | State College, Mississippi |
| R. W. Rogers | Mississippi State University | State College, Mississippi |
| E. U. Dillard* | North Carolina State | Raleigh, North Carolina |
| W. C. Godley* | Clemson University | Clemson, South Carolina |
| J. R. Hill | Clemson University | Clemson, South Carolina |
| C. S. Hobbs* | University of Tennessee | Knoxville, Tennessee |
| L. L. Christian | University of Tennessee | Knoxville, Tennessee |
| H. M. Jamison | University of Tennessee | Knoxville, Tennessee |
| T. C. Cartwright* | Texas A and M University | College Station, Texas |
| H. A. Fitzhugh, Jr. | Texas A and M University | College Station, Texas |
| R. R. Petty, Jr. | Texas A and M University | College Station, Texas |
| H. O. Kunkel** | Texas A and M University | College Station, Texas |

| Name | Institution | State |
|---|---|---|
| T. J. Marlowe* | Virginia Polytechnic Institute | Blacksburg, Virginia |
| K. P. Bovard | Beef Cattle Research Station | Front Royal, Virginia |
| M. J. Burris | USDA, CSRS | Washington, D. C. |
| R. E. LeClerg | USDA, ARS, AHRD | Beltsville, Maryland |
| R. P. Lehmann | USDA, Biometrical Services | Beltsville, Maryland |
| R. S. Temple | USDA, ARS, AHRD - Investigations Leader, S-10 | Knoxville, Tennessee |
| E. J. Warwick | USDA, ARS, AHRD | Beltsville, Maryland |
| E. H. Cobb | University of Hawaii | Honolulu, Hawaii |
| H. H. Stonaker | Colorado State University | Fort Collins, Colorado |

* Technical Committee members

** Representing Dr. R. E. Patterson, Administrative Advisor, S-10

MINUTES OF S-10 EXECUTIVE COMMITTEE MEETING
7:30 p.m., June 21, 1964
State College, Mississippi

Executive Committee Chairman, T. B. Patterson, presided.

Others present - C. J. Brown, C. J. Christians, E. U. Dillard, H. O. Kunkel, C. E. Lindley, R. S. Temple, and E. J. Warwick

Chairman Patterson announced the appointment of a resolutions committee of the following members:

W. C. McCormick, Chairman
T. C. Cartwright
N. W. Bradley

Dr. H. O. Kunkel, representing Dr. R. E. Patterson, Administrative Advisor for the project, and Dr. E. J. Warwick were welcomed to the meeting. Dr. Kunkel was asked to convey to Dr. Patterson the committee's regrets that he was unable to attend the meeting this year.

The Executive Committee reviewed the program plans for this year's meeting. C. E. Lindley outlined the program for the Monday afternoon tour and the visit at the central locations Tuesday afternoon. R. S. Temple briefly reviewed the program for the morning sessions. He also outlined a proposal that he and the Texas station wished to present to the Technical Committee for consideration. Dr. Temple moved that the Texas group be given opportunity to present this material. Motion was seconded by E. U. Dillard and approved. He also discussed briefly material which he had prepared in a folder to be provided each committeeman at the meeting.

There was discussion concerning the revision of the S-10 project during which it was emphasized that all members of the Technical Committee be requested to very critically review the rough draft of this revision and determine if improvements could be made.

Chairman Patterson raised the question of having a committee to consider regional studies and the data to be taken to meet specific study objectives. A motion was made by C. J. Brown and seconded by E. U. Dillard that this be a function of the Data Collection and Analysis Committee. The motion carried.

R. S. Temple reviewed material reported in his paper at the Southern Section meeting of the American Society of Animal Science on the reproduction study and questioned whether or not there was sufficient information in this material for a regional publication or journal article. It was decided that this matter would be presented to the Technical Committee at its business meeting for appropriate action.

Dr. Warwick briefly reviewed the ARS-AIQ proposal relating to importation of semen from countries having foot-and-mouth disease. A motion was made by H. O. Kunkel and seconded by C. J. Brown that this matter be brought to the attention of the resolutions committee for appropriate action. The motion carried.

Respectfully submitted,
E. U. Dillard, Secretary

MINUTES OF S-10 TECHNICAL COMMITTEE MEETING
June 21-24, 1964
State College, Mississippi

The S-10 Technical Committee was called to order at 8:00 a.m. on June 22 in the Alumni Student Building by Chairman T. B. Patterson. Dr. C. E. Lindley, Head of the Animal Husbandry Department at Mississippi State, introduced staff members of the host institution. He then introduced Dr. D. W. Colvard, President of Mississippi State, who welcomed the group to the campus and to Mississippi. He spoke briefly of the beef cattle industry in Mississippi and of the animal husbandry program at Mississippi State.

The program proceeded according to the schedule, which also forms a part of this report, with the exception of a short business meeting which was held on the afternoon of June 23.

At the meeting of the Executive Committee and in the June 24 regular meeting R. S. Temple discussed briefly the proposed new project to be undertaken by the Texas station, Basic Genetics of Beef Cattle. Certain ARS funds previously assigned to other states have been or will be withdrawn to support this project. The project will be concerned primarily with gene frequency, immunogenetic markers, genetics of blood groups, and so forth in beef cattle.

There was a presentation by H. A. Fitzhugh, of the Texas station, concerning a regional study of cow weights. This is a study proposed by the Investigations Leader and the Texas station as a regional effort. There followed a discussion of the use of data collected by the various states over a number of years and whether or not such data could be adequately analyzed and summarized by one not familiar with it. There seemed to be a definite opinion by most that when regional efforts were to be taken on a specific problem, data to fit the need should be collected rather than trying to fit previously collected data which would most probably lack uniformity. Though no formal action was taken, there was no apparent objection to cooperation in making data available to Mr. Fitzhugh.

Marvin Koger indicated an interest in using data on hand in the various states to study reproductive performance of beef cattle in the region, but no specific proposal was presented at this time.

R. R. Petty, of the Texas station, presented a resume' of his paper entitled "Comparison of Selection Procedures and Indexes for Growth and Conformation Traits for Beef Bulls, Heifers, and Cows". He had shown excellent workmanship in the preparation of this paper, a fact acknowledged in the report of the resolutions committee. It is anticipated that this material will be published by the Texas station. Petty also distributed copies of "A Summary of Genetic and Phenotypic Parameters of Growth and Conformation Characteristics of Beef Cattle."

On the afternoon of June 23 there was considerable discussion of the project revision as presented to the group at this time. In general,

the feeling was that the revision should reflect more of a regional effort approach and that the section of the new project dealing with the procedural statements should be strengthened along this line. Other points which were called to the attention of the Project Revision Committee were: (1) consider deletion of the last paragraph under Objective 1, and (2) substitute criss-cross for rotational backcross in all places.

There was also much discussion regarding what should be included in the list of publications which is to be attached to the project. Most members seemed to be of the opinion that the attached list should be small and include only regional publications, technical articles, and noteworthy station publications, but that a list of all published material relating to the S-10 project should be prepared and kept on hand and up to date in the Investigations Leader's office.

The Technical Committee was declared to be in business session at 2:20 p.m. on Tuesday, June 23.

Godley made a motion that the Project Revision Committee take into consideration the points raised in the open meeting and make a decision as to changes to incorporate. Koger seconded the motion, and it was approved.

The use of data from several stations by one station for a regional publication was discussed, but no action was taken at this time.

Motion was made by Koger that the Project Revision Committee enlarge on section 6, last paragraph, to emphasize regional effort in planning of research and publication of data. Motion was seconded by Hobbs and carried.

In a discussion on objectives and procedural statements, it was pointed out that personnel of each station should critically review the statement for the work of that station and consider maximum flexibility of objectives. It was suggested that these statements be revised within the week and that edited copies of the entire revision be returned at an early date. Each person involved should ask himself if the objectives are imaginative and if they reflect the plans of the foreseeable future. Information on the revision should be directed to the Investigations Leader.

Motion was made by Cartwright to adjourn the business session, seconded by Lindley, and the session was adjourned.

At the session on June 24, the Chairman announced the following committees for the coming year.

Committee on Data Collection and Analysis
T. B. Patterson, Chairman
R. J. Cooper
Noah England
W. C. Godley

Committee on Standardization of Carcass and Meats
C. S. Hobbs, Chairman
C. J. Christians
E. U. Dillard
W. C. Godley

Committee on Annual Report Forms
C. J. Brown, Chairman
Marvin Koger
T. J. Marlowe

S-10 Project Revision Committee
T. C. Cartwright, Chairman
C. J. Brown
E. U. Dillard (as Chairman of the Executive Committee)
R. S. Temple

Koger moved that the Executive Committee be given the responsibility of assisting the Project Revision Committee in expediting the revision. Motion was seconded by Hobbs and carried.

Patterson moved the acceptance of the report of the Committee on Data Collection and Analysis. The motion was seconded by Hobbs and passed. All committee reports are considered to be a part of the Minutes and are to be included in the Annual Report.

Hobbs moved acceptance of the report of the Committee on Standardization of Carcass and Meat. Godley seconded the motion and it passed.

Brown moved for acceptance of the report of the Committee on Annual Report forms. Motion was seconded by Bradley and passed.

McCormick gave the report of the Resolutions Committee and moved that it be accepted. Bradley seconded the motion and it passed.

A special resolution was presented by McCormick, as Chairman of the Resolutions Committee, honoring former Technical Committee member Dr. Warren Gifford. McCormick moved adoption of this special resolution and Hobbs seconded the motion. The motion was unamiously adopted and a standing ovation given to Dr. Gifford.

Chairman Patterson asked for invitations for the 1965 Technical Committee meeting. An invitation to meet at the University of Kentucky was extended by Bradley, Technical Committeemen from Kentucky. A motion to accept this invitation was made by McCormick, seconded by Hobbs, and was passed.

Cartwright and Hobbs both indicated they were thinking of inviting the group to their stations for the 1966 meeting, but no action was requested or taken on these announcements.

A motion was made by McCormick that the Technical Committee recommend to Texas that the reports presented by them to this group be published. The

motion was seconded by England and passed. Dr. Kunkel, speaking for the Texas station, gave tentative approval to this request.

England was elected to the Executive Committee.

Chairman Patterson asked that anyone having ideas or suggestions for the 1965 meeting please communicate with the Executive Committee.

There was some discussion about the time devoted to the meeting of the Technical Committee. A suggestion was made that consideration be given to having each committeeman on some sub-committee. It was also suggested that committee reports be presented early during the meeting so that they can be considered adequately by each Technical Committeeman.

Dr. Kunkel, representing the Administrative Advisor, Dr. R. E. Patterson, spoke briefly to the group. He stressed the importance of publication of research results and announced that the Regional Association of Experiment Station Directors had voted to set aside $150,000 annually to permit development in areas of excellence at stations showing excellence in some area. He also announced that the Texas station was coming out with a new publication series to be known as Technical Monographs and that Cartwright's study on cow performance among breeding groups would be published as Technical Monograph No. 1 - Heterosis in Beef Cattle, T. C. Cartwright, G. F. Ellis, Jr., and W. E. Kruse.

Dr. Warwick spoke briefly to the group regarding beef cattle research and the use of federal money. He stated that there was a tendency to use any new federal funds for short-time or emergency needs. Everywhere there is a trend toward more basic research. He discussed the implications of this philosophy with regard to the generally long-term projects in beef cattle breeding research. He pointed out that our research efforts should be directed only to those important items and that a critical appraisal of our projects should be made. The need to publicize our labors was emphasized.

Dr. Burris, of CSRS, presented several items of interest to the group. His comments are included elsewhere in this report.

Chairman Patterson presented to the group the USDA proposal to amend the Code of Federal Regulations regarding the importation of animal semen. There was a brief discussion of the implications of this amendment regarding beef cattle breeding research. A motion was made by Koger and seconded by England that the Chairman write a letter to the Director, Animal Inspection and Quarantine Division, ARS, in support of the amendment, giving reasons why such an amendment could benefit this and other research groups and also expressing the hope that some simplifications of procedure might be accomplished in order that these research groups might make use of this facility as economically as possible. The motion was passed. Chairman Patterson suggested that each committeeman also check with his Experiment Station Director and advise him of our action.

Brown moved this year's report be prepared in line with the recommendations of the Committee on Annual Report Forms. Marlowe seconded the motion, and it was passed.

Dillard moved approval of the minutes of the Executive Committee meetings of February 3 and 21. The motion was seconded by McCormick and was passed.

Lindley, Technical Committeeman from Mississippi, expressed pleasure at having had the Committee at Mississippi State for its meeting.

There being no further business, the meeting was adjourned by Chairman Patterson.

Respectfully submitted,

E. U. Dillard, Secretary

## Report of the Committee on Data Collection and Analysis

1. This committee will review data being collected at each station within the Region with the idea of standardizing certain collection procedures.

2. The following areas of possible regional studies should be examined:
   a. Cow size
   b. Heritability of reproductive efficiency
   c. Certain adjustment factors
   d. Beef carcass studies.

Respectfully submitted,
T. B. Patterson, Chairman
T. C. Cartwright (for R. J. Cooper)
Noah England
W. C. Godley

## Report of the Committee on Carcass and Meat Standardization

The Committee on Carcass and Meat Standardization recommends:

1. That its members work with those people in meats research at the several stations in revising and bringing up to date the data collection form which was previously presented to the Technical Committee with the suggestion that it be used in collecting carcass data.

2. That the revised form be circulated to each Technical Committeeman for review and criticism. (Tentative date for completion of this revision is October 25.)

3. That the committee take the initiative in stimulating research work on criteria and methods of evaluating and determining eating qualities of cooked and raw beef.

Respectfully submitted,
C. S. Hobbs, Chairman
R. J. Cooper
W. C. Godley
E. U. Dillard

## Report of Committee on Annual Report Forms

The committee on Annual Report Forms recommends that the Annual Report consist of a written summary similar to that used for 1963 with summary tables of any pertinent material that is necessary to clarify the progress being made on the project. The tabular material used will be chosen at the discretion of the Technical Committeeman, but should be kept to a minimum and should be consistent with meaningful information.

In addition, it is recommended that Form IV be modified to include certain material now presented in Forms I, II, and III and that Forms I, II, and III no longer be used. It is recommended that Form V be continued in its present form.

Respectfully submitted,
C. J. Brown, Chairman
Marvin Koger
T. J. Marlowe

## Report of the Committee on Resolutions

The report of the Resolutions Committee was as follows.

BE IT RESOLVED that the S-10 Technical Committee express its appreciation to Dr. C. E. Lindley and his entire staff for their wonderful hospitality, excellent arrangements and facilities, and well-planned tours during our Technical Committee meeting at Mississippi. Be it further resolved that a copy of this resolution be sent to President D. W. Colvard, Vice President for Agriculture and Forestry W. L. Giles, and Director H. H. Leveck, as well as to the Animal Husbandry Department.

BE IT RESOLVED that the S-10 Technical Committee express appreciation to guest speakers, Dr. H. H. Stonaker, D. K. P. Bovard, Dr. J. L. Carmon, and Dr. H. O. Kunkel, for their excellent contributions to the S-10 program and that the secretary extend our expression of appreciation by letter to these speakers.

BE IT RESOLVED that the S-10 Technical Committee express to the Mississippi Angus Association its sincere appreciation for their fine support of beef cattle breeding research in Mississippi and the rest of the Southern Region, for their most excellent and appropriate steak fry, and for their hospitality during the steak fry. Be it further resolved that a copy of this resolution be sent to Roger Davis, President of the Mississippi Angus Association, Natchez, Mississippi.

BE IT RESOLVED that the S-10 Technical Committee recognize Robert R. Petty for his unusual ability and efforts in preparing and presenting the excellent and comprehensive study entitled "Comparison of Selection Procedures and Indexes for Growth and Conformation Traits for Beef Bulls, Heifers, and

MINUTES OF THE MEETING OF THE EXECUTIVE COMMITTEE S-10

6:00 P.M. February 3, 1964 in Atlanta Georgia

Executive Committee Chairman, T. B. Patterson, presided

Others Present: E. U. Dillard, C. J. Brown, R. S. Temple, E. J. Warwick
C. E. Lindley, and C. J. Christians

Dr. Patterson delcared the meeting in session and requested consideration of a date for the Technical Committee meeting to be held at Mississippi State University. Dr. Lindley stated that the Mississippi group, as hosts, would prefer to have the meeting June 22-24. This date was tentatively approved by the Executive Committee, and Dr. Temple suggested that all Technical Committeemen be advised of the date and asked to indicate to him any objections to the date of June 22-24 so that clearance could be made with Mississippi for an earlier date.

Dr. Temple suggested that this year's program might be built around procedures for testing inbred and selection lines of cattle. T. B. Patterson inquired as to work within the region where lines were being developed or tested. It was pointed out that only Mississippi, Tennessee, and the Front Royal, Virginia stations had projects of this nature.

There was discussion concerning outside speakers. A motion to invite Dr. H. H. Stonaker was made by R. S. Temple, seconded by C. J. Brown, and passed.

The possibility of getting Dr. Carmon, from Georgia, to discuss analysis of data was discussed. The motion to invite him was made by C. J. Brown, seconded by E. U. Dillard, and passed. It was also agreed that K. P. Bovard would be asked to discuss the work with inbred lines at Front Royal. C. E. Lindley gave a brief discussion of the plans of the Mississippi State group for the part of the program pertaining to that station's work. It was agreed that T. B. Patterson would contact Dr. Kunkel, of the Texas station, to see if he would discuss physiological age at the Mississippi meeting.

A tentative program for the two and one half day meeting was outlined and approved. Also approved was an Executive Committee meeting for Sunday evening, June 21, prior to the Technical Committee meeting. Finalization of the program was to be accomplished by T. B. Patterson, R. S. Temple, and C. E. Lindley.

The meeting adjourned at 9:30 p.m.

Respectfully submitted,

E. U. Dillard
Secretary

Cows" and the report "A Summary of Genetic and Phenotypic Parameters of Growth and Conformation Characteristics of Beef Cattle". Be it further resolved that the committee wishes Robert well during his period of military service and encourages his continued interest in animal breeding.

BE IT RESOLVED that the S-10 Technical Committee express to Dr. Warren Gifford its deepest appreciation for his contributions to S-10 and the entire beef cattle industry, for his services as a leader and technical worker, and further expresses admiration and respect to Dr. Gifford for his continued interest, advice, counsel, and sense of humor. Since Dr. Gifford is retiring July 1 of this year from the University of Arkansas, the Resolutions Committee recommends to the Technical Committee that we unamiously endorse this resolution and wish him well.

Respectfully submitted,
W. C. McCormick, Chairman
T. C. Cartwright
N. W. Bradley

## COMMENTS OF M. J. BURRIS, CSRS REPRESENTATIVE

### Items of Interest to S-10 and NC-1 Technical Committees

1. In addition to the six bills on humane treatment of laboratory animals introduced in the U. S. Congress by July 1963, four other bills - HR 5430, HR 8077, HR 8957, and HR 10138 - have been introduced. HR 8957 has been cited by the American Society of Animal Science as being beneficial to research and not of a restrictive nature. These bills are not moving at the present time. A new attack centers on the confinement production of economic species which is designated inhumane.

2. A movie prepared by the Veterans Administration may be of interest to animal scientists in your group. It is entitled, "Study from Life; Part I, Laboratory Animals in Medical Research." Write to Central Office Film Library (037B1), Veterans Administration, Washington, D. C. 20420.

3. The revised Manual of Procedures for Cooperative Regional Research has been published. Copies have been distributed to the technical committee members.

4. Our agency has recently been renamed the Cooperative State Research Service to more accurately reflect responsibilities under some of the new laws which our office administers.

5. The organization of the USDA research and Marketing Advisory Committees was revised August 26, 1963. The Animal and Animal Products Research Advisory Committee replaces four previous committees of Dairy, Sheep and Wool, Livestock and Poultry. This committee met on February 17-20, 1964, in Washington, D. C. Statements of interested commodity groups were invited for the first time.

6. Summaries of Current Program and Report of Progress of Research in the USDA for 1963 for animal species or commodities were sent to experiment station directors for use by station personnel.

7. Several months ago, Dr. Keith Gregory, NC-1 Investigations Leader, made a compilation of Hatch projects with beef cattle using the CSRS Form 20 files available at the Nebraska station. Similar files are located at each experiment station in the director's office and the library, and show active research projects at all State stations. These can be used by scientists in planning research.

8. A Conference on Estrous Cycle Control in Domestic Animals was scheduled at the University of Nebraska on July 9-10, 1964. Contact Dr. Carl F. Sierk, CSRS, for details. The proceedings will be available.

9. On July 22, 1963, Public Law 88-74, 88th Congress, HR 40 to assist the States to provide additional facilities for research at the State Agricultural Experiment Stations was enacted. There is no money in the 1965 budget under this Act. The Act provides for distribution of funds on a formula basis and requires matching of funds by the State.

10. Requests for technical information may be directed to the National Referral Center for Science and Technology, Library of Congress, Washington 25, D. C. This agency will refer inquirers to organizations, institutions, or individuals who are in a position to furnish information desired.

11. During the past year, I reviewed a referencing service, "Genetic Citation Index." This service pulled together related references which have cited the same original papers. A referencing service using procedures in the Genetic Citation Index is now available. It's name is "Science Citation Index," and it deals generally with the biological sciences. The current issue lists source references appearing in 1961 and all papers which they cited.

12. Federal-grant research payments to State stations for fiscal 1964 are $40,906,000; increases included $2,183,000 for Hatch, $1,000,000 for forestry research and $1,500,000 for basic research. For the previous year, Federal-grant expenditures were $36,658,000 compared to State expenditures for the same period of $135,982,000. In most cases, this is the total expenditure for research and does not reflect a net cost which might be somewhat less because of sales. However, in some cases, substation costs and other costs may not be included. For animal science, including veterinary, 1963 expenditures were Federal-grant $8,256,000 and State $31,917,000.

13. The following regulation was recently proposed by Meat Inspection Division, ARS, USDA:

9.19 Animals used for investigation.

No animal used in research investigation shall be passed for slaughter unless the sponsor or investigator has submitted acceptable data demonstrating that such use will not result in the presence of any unwholesome condition in the edible parts of such animal.

# INBREEDING AND LINECROSSING HEREFORD CATTLE[1]

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Variations in heterozygosity and homozygosity in cattle are being investigated in several ways. The numerous comparisons of crossbreds and purebreds with which we are familiar give us the most general picture of the results, and by studying purebreds and crossbreds we can sweep across the subject with relative ease of investigation. The development of inbred lines and the crossing of lines is a procedure necessary for investigating whether the effects of increased differences in homozygosity are linear. We know in a broad sense they cannot be. In Nature, if one draws upon the broader spectrum of species characteristics, one finds life forms more likely to be successful in the highly homozygous state than in the highly heterozygous condition. Very wide crosses as exemplified by species and generic crosses are usually failures, but the number of successfully selfing species in plants must be great.

It is not necessary to elaborate on why we initiated in 1946 an experiment with Hereford cattle in which we started more closely inbred lines in a herd of modest size than we or anyone else thought could be successfully continued over any length of time. I was lucky enough to return from World War II at the same time W-1 was beginning and had been greatly excited by the success of hybrid corn and the swine work of Dr. Lush in the 1940's. Thus, as project leader, I was able to attach an inbreeding-crossing experiment to a size-type experiment in this relatively small breeding herd (125 to 175 total breeding cows) at the San Juan Basin Station near Durango. Most of what I have to say is relative to results there.

The lines were begun with what was already in the herd and from a nuclei of cow purchases made with the help, principally, of Sears Foundation. Closest possible matings were made - sire to daughters, half-sibs. We usually bought about six cows or heifers and arranged to have them bred to their sire. These were carried on as single-sire lines. In the past three years, we have used two sires in some lines. Half or more of the mates of a bull are linecross cows; thus, the comparisons of inbreds and linecrosses are on a contemporary within-sire basis and it further reduced the cow herd from which the twelve lines at Fort Lewis were formed. We also had a few lines on a lease basis off the station.

Selection of bull replacements has been on an index in which weaning weight is given about twice the emphasis as daily gain on feed test. The index is:

$$I = \text{adjusted weaning weight} + 50 \times \text{daily gain.}$$

Cows are culled on the basis of pregnancy test if the numbers in the line permit. Heifers are retained on the basis of age, with the older heifer calves being retained and the younger heifer calves going to the feedlot. Thus, there is no purposeful selection among the females for growth rate and so forth. This seemed helpful experimentally, for it permits assumptions on the female side of

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[1]Paper presented at the S-10 Technical Committee Meeting, June 21-24, 1964, State College, Mississippi.

a random population relative to observations other than fertility and season of calving. This seemed a greater gain than the slight genetic change which might be initiated from other selection pressure in the cow herd.

The bulls are individually fed in a barn on a slatted floor. A recent enlargement of the breeding herd has caused us to have about 100 station bulls to feed annually, along with 70 cooperator bulls. Recently, the bulls have been divided into two groups, one fed as calves and another as short yearlings. We are currently accumulating data on the effects of this division on gains and efficiencies.

Even with conscientious personnel and some pastures double fenced, I do not live under the illusions that matings were exactly as described here. Animals escape and even re-enter pastures, and we suspect that infrequently calves at birth become mothered by dams other than their own. Records are also subject to transcription and other errors. Thus, pedigree errors over this period of time must have happened, and results are subject to those. This is particularly a serious problem in this type of experiment and it cannot be ignored as a source of error and bias in one direction. Another factor is the role of selection of lines. Those lines which fall into disfavor or fail to reproduce are discarded; thus, biasing the over-all estimate of inbreeding effects so as to make them likely to be underestimations.

Dr. G. O. Harwin has just completed in his Ph.D. dissertation an exhaustive analysis of inbreeding and crossing effects on weights in the Colorado station herd. In his study, covering 830 bulls and 878 heifers - of which 396 bulls and 393 heifers were inbred, the data were fitted to five least squares equations. The models from Harwin's thesis are indicated in table 1. It is the first study we have made in which we have had a few degrees of freedom on models themselves. This has been most revealing, for what comes out differs a great amount from what seem to be small changes in models.

For example, even year effect estimates, which would reasonably seem to be approximately the same from model to model, show interesting differences in values of constants. Out of the 17 years included, I selected from Model 4 the five years which produced the largest weights and the five years which produced the lowest weights. As is apparent in table 2, the choice of models has a great effect in evaluation of such straightforward effects as years. I mention this in preparation for the extreme differences among models one encounters in attempting to evaluate inbreeding effects.

The complex and perplexing nature of these curves on inbreeding effects seem to defy explanation. Perhaps the few observations at very high levels of inbreeding - 50 percent and above - plus some culling of lines may cause the upturn in weights at high levels of inbreeding. In an attempt to simplify these results, effects on weights in the 10 to 25 percent range were compared with the weights for the 30 to 45 percent range. Then the difference in weights at midpoint of 17 percent and 37 percent inbreeding were examined. The average change in weight over this 20 percent range in inbreeding for each percent of inbreeding change is shown by the model in table 3.

TABLE 1. Models for Least Squares Analyses
(Harwin, Table 2)

| Variable | Models 1 | 2 | 3 | 4* | 5* | Abbreviated definitions |
|---|---|---|---|---|---|---|
| $u$ | + | + | + | + | + | Intercept of Y axis |
| $Y_i$ | + | + | + | + | + | Effect of ith year of birth |
| $A_j$ | + | +** | +** | + | + | Effect of jth age of dam |
| $L_k$ | + | + | + | + | + | Effect of kth line of sire by mating system |
| $YA_{ij}$ | + | | | | | Effect of ijth year x age of dam sub-class |
| $b_1Fc_{ijk}$ | + | + | + | | + | Linear regression of weaning weight on inbreeding of calf |
| $b_2Fc^2_{ijk}$ | + | + | | | + | Quadratic regression of weaning weight on inbreeding of calf |
| $b_3Fc^3_{ijk}$ | + | + | | | + | Cubic regression of weaning weight on inbreeding of calf |
| $b_4Fd_{ijk}$ | + | + | + | | + | Linear regression of weaning weight on inbreeding of dam |
| $b_5Fd^2_{ijk}$ | + | + | | | + | Quadratic regression of weaning weight on inbreeding of dam |
| $b_6Fd^3_{ijk}$ | + | + | | | + | Cubic regression of weaning weight on inbreeding of dam |
| $Fc_m$ | | | | + | | Effect of mth inbreeding of calf category |
| $Fd_n$ | | | | + | | Effect of nth inbreeding of dam category |
| $b_7D_{ijk}$ | + | + | + | + | + | Regression of weaning weight (age adjusted) on age of calf (season of birth effect) |
| $e_{ijkl}$ | + | + | + | + | + | Error term |
| $W_{ijkl}$ = | (Σ) | (Σ) | (Σ) | (Σ) | (Σ) | Estimated weaning weight of calf |

i = the ith year of birth
j = the jth age of dam
k = the kth line of sire
l = the lth calf
m = the mth inbreeding of calf category (5% increments
n = nth inbreeding of dam category (5% increments)
* Models confined to inbred animals only
** Additional sub-classes of age of dam in these

TABLE 2. A Comparison of Five Models from Five Heaviest Weaning Years and Five Lowest Weaning Years, Based on Model 4 (Harwin's thesis)

| Year | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ♀ | ♂ | ♀ | ♂ | ♀ | ♂ | ♀ | ♂ | ♀ | ♂ |
| Poor years: | | | | | | | | | | |
| 1946 | - 4 | + 28 | - 7 | + 4 | - 5 | - 8 | - 40 | - 35 | - 30 | - 40 |
| 1947 | - 39 | - 26 | - 16 | - 21 | - 14 | - 19 | - 21 | - 24 | - 19 | - 21 |
| 1952 | - 27 | - 41 | - 28 | - 40 | - 30 | - 42 | - 25 | - 27 | - 32 | - 32 |
| 1956 | - 22 | - 19 | - 18 | - 5 | - 18 | - 3 | - 15 | - 1 | - 13 | 0 |
| 1961 | - 8 | + 6 | - 9 | - 9 | - 12 | - 6 | - 15 | - 16 | - 14 | - 7 |
| Sum | -100 | - 52 | - 78 | - 71 | - 79 | - 78 | -116 | -103 | -108 | -100 |
| Good years: | | | | | | | | | | |
| 1953 | 32 | 19 | 30 | 23 | 29 | 22 | 27 | 20 | 27 | 17 |
| 1954 | 14 | 23 | 16 | 24 | 25 | 25 | 35 | 28 | 35 | 30 |
| 1955 | 21 | 35 | 21 | 42 | 43 | 42 | 20 | 49 | 18 | 15 |
| 1957 | 0 | - 10 | 4 | - 2 | 4 | 1 | 23 | 3 | 21 | 3 |
| 1959 | - 8 | 6 | - 12 | - 9 | 35 | 38 | 36 | 23 | 3 | 6 |
| Sum | 79 | 72 | 59 | 78 | 136 | 128 | 141 | 123 | 104 | 101 |

TABLE 3. Predicted Average Effects on Cattle Weaning Weights of each Percent Inbreeding from Harwin's Five Models Based on Inbreeding of 10-25 Percent vs. 30-45 Percent

| Model | Inbreeding Effects | | | | | |
|---|---|---|---|---|---|---|
| | Calf | | Dam | | Calf + Dam | |
| | F* | M* | F* | M* | F* | M* |
| 1** | - .75 | - .70 | - .15 | + .30 | - .90 | - .40 |
| 2 | - .70 | - .45 | -1.00 | + .10 | -1.70 | - .35 |
| 3 | - .23 | - .41 | - .76 | - .71 | - .99 | -1.12 |
| 4*** | -1.10 | -1.65 | - .10 | + .90 | -1.20 | - .75 |
| 5 | -1.10 | -1.05 | - .20 | + .75 | -1.30 | - .30 |
| Average | - .78 | - .85 | - .44 | + .26 | -1.20 | - .58 |

* Sex of calf
** Models 1, 2, and 3 are based on inbred and linecross calves.
*** Models 4 and 5 are based on inbreds only.

Earlier appraisals on inbreeding effects using a single model had indicated somewhat larger effects than in Harwin's present study. In addition, it may be of interest to point out that Brinks et al. are in the process of publishing a paper on the Miles City Line 1 herd in which inbreeding effects are noted as follows: males, -.59; dams of males, -1.88; females, -2.11; and dams of females, -.43. Both studies indicate marked inbreeding depression. However, inbreeding effects seem likely to be different in different lines and perhaps under different environments.

These estimates have a bearing on the general observations that we have found almost twice the heterosis in weaning weights of heifers as of bull calves. This is substantiated by the total greater regression values for heifers than bulls. Fort Robinson data seem to point in that direction, too. The question persists - are there environmental artifacts and interactions responsible, or can it be due to some special role of sex-linked genes? To date, environmental interaction effects do not seem apparent. If anything, heifers' weights are more greatly influenced by year effects than are bull weights. Evidence in sheep and swine needs to be freed of the confounding effects of unequal sex distribution, intra-litter, with accompanying unequal levels of competition.

Harwin's study on effects of inbreeding in females on yearling gain, yearling weight, two-and-one-half year old weight, and three-and-one-half year old weight indicate a decreasing difference between inbreds and crosses as the females increase in age. In another study, five to eight-year-old inbred cows were as heavy as linecross cows. The correlation between yearling gain and weaning weight was 0.03, while that between weaning weight and yearling weight was 0.6.

Moore's study of inbreeding effects on rates of gains of bulls on feed test showed very little inbreeding depression. Later data indicated some more difference in inbreds and crosses than he reported.

TABLE 4. Unadjusted Means of Unselected Hereford and Hereford x Angus-Shorthorn Yearling Bulls which Completed Feed Tests

| | Birth years | N | Actual weaning weight | Av. daily feedlot gain | Adjusted* feed/gain |
|---|---|---|---|---|---|
| Controls | 1955-1962 | 43 | 417 | 2.40 | 6.66 |
| Crossbreds | 1957-1962 | 22 | 504 | 2.78 | 6.65 |
| Inbreds | 1952-1962 | 238 | 401 | 2.36 | 6.56 |
| Linecrosses | 1952-1962 | 324 | 425 | 2.48 | 6.50 |

* Adjusted for initial weight

These more recent but unadjusted data, shown in table 4, indicate about 5 percent heterosis in weaning weight and daily gain for bulls. Feed utilization is about the same for inbreds and linecrosses. The control Hereford bulls are

selected from among the better range bulls offered at auction in the area. Their crossbred sons out of Shorthorn-Angus cows were outstanding in weight for age.

Other data which have been accumulated on various traits are shown in table 5, along with some crossbreeding results from other stations and some heritability summaries not taken exclusively from the Colorado data. The results do seem clear that inbreeding depression is different for different traits, and the degree of regression or heterosis is generally the inverse of the heritability. That is, high heritabilities more often go with low levels of heterosis and low heritabilities may be associated with high levels of heterosis.

TABLE 5. Average Estimates of Heritability and Heterosis in Beef Cattle

| Traits | Herit-ability percent | Crossbreds purebreds* 2X percent | Crossbreds purebreds* 3X or BC percent | Linecross purebreds** percent | Linecross inbreds*** percent |
|---|---|---|---|---|---|
| Weaning weight | 30 | 3 | 20 | 4 | 10 |
| Size of dam | 70 | 0 | | | 0 |
| Daily gain (bulls, steers) | 45 | 3 | 4 | 5 | 5 |
| Days to finish | 25 | | | | |
| Calving interval | 8 | | | | |
| Percent calf crop | 7 | 16 | 12 | | 12 |
| Male fertility | ? | | | 16 | 10-12 |
| Feed per pound of gain | 39 | | | - 2 | - 8 |
| Carcass cut-out | 25-50 | | | | |
| Slaughter grade | 0 | 5 | 2 | | |
| Marbling | 0 | | | | |
| Tenderness (shear value) | 60 | | | | |
| Dressing percent | 0 | | | | |
| Susceptibility to cancer eye | 40 | | | | |
| Final weight (bulls) | | | | 2 | 6 |

* The advantage of crossbreds over purebreds
** The advantage of linecrosses over purebreds
*** The advantage of linecrosses over inbreds
2X = cross between two breeds
3X = cross between three breeds with crossbred dams
BC = backcross between two breeds with crossbred dams

For carcass characteristics, we have not yet analyzed the effects of inbreeding and crossing. The differences between lines have been erratic to date, as indicated in tables from Colorado General Series 807. We hope to add data on heifers and yearling bull carcasses to that on cows removed from the herd. Our first group on this encourages us to think that perhaps some differences may be amplified in mature cows over those in yearlings.

Performance by Line.

The production of linecrosses and inbreds is summarized in the accompanying tables. Lines and linecrosses are significantly different in several traits, and those working with cattle know of many other traits, too, in which they differ - such as color, markings, skeletal shapes, size and shape of teats and udder, disposition, incidence of cancer eye, and even lumps. Another interesting observation is that, with the exception of dwarfism in the outbred comprests and controls, I think every spectacularly abnormal calf has occurred in the lines. Such things as cross-eyes, double eyelids, spastics, intersexes, and dwarfism have not occurred in the linecross herd nor in the crossbred herd. Spectacular type lethals have not been biologically troublesome. Our biggest problems just now seem to center about fertility problems in bulls. This seems to be more acute in the past 4 to 5 years. It must be a failure in the somatic environment, for the genotypes of haploid sperm cells in the inbreds should be as functional as they are in the cross. Despite evidence of curvilinearity in body weights, we have difficulty getting animals about 50 percent inbred to function as breeders.

It seems that these characteristically different patterns should be studied in greater depth from a biochemical and physiological approach than we are financially able to do. This, perhaps, is only of academic interest to the important problem of breeding more economical cattle more quickly. Mr. Joe Armstrong, of Colorado State, is currently evaluating trends which may be resulting from the selections practiced, and it looks as if the environment has improved and the genotype has regressed!

However, another approach is based upon the isolation of line differences. We assume that these mean differences are real and one of the powers of the multi-line approach is that culling may be by lines. On this basis, results look favorable for the multi-line approach. About all we can compare Colorado results with are the as yet unpublished results of Brinks et al. on long-term regressions of estimated genetic changes within the Miles City Line 1 herd.

If these regressions are applied to an 18-year period for comparison with Colorado results, we have the picture shown in table 6. It is about as good as I think we can do at this time to compare the possible results of single vs. multi-line use of a given size of population. The problems and inaccuracies of measuring genetic trends, along with differences in selection methods of environmental effects, are recognized.

TABLE 6. Single Line vs. Multi-Line Approach, Based Upon a Population of about 100 Cows

| | Genetic change in 18 years | |
|---|---|---|
| | Weaning wt. (lbs.) | Final wt.(lbs.) |
| Single line (Brinks' analysis of Line 1) | 22 | 54 |
| vs. | | |
| Multi-line: | | |
| Best inbred line* | 34 | 62 |
| Best crossing line* | 39 | 81 |
| Best three crossing lines* | 24 | 56 |

* 1952-1962 calf crops, selected from data on inbred lines and crosses of 14 lines at San Juan Basin Station.

Progeny Testing in Different Areas.

The Mississippi station is carrying on a very important project in the complete progeny testing of sires from different lines and herds. We have learned a great deal about our own lines from this work. We have been particularly interested in noting that the ranking of growth rates of progeny groups is similar here to that in Colorado and California. Also, I believe the Mississippi work has provided some of the first and most conclusive evidence available on breed and possibly line differences in such carcass characteristics as marbling. It is particularly conclusive on Angus vs. Hereford carcasses.

We have spent a considerable amount of effort in getting sires into use where some kind of progeny data could be obtained. In some herds the information has been as comprehensive and carefully taken as in experiment station herds. By and large, the results in the field parallel those at the station, leading us to believe that the controls and the average of all unexcelled linecrosses may be fairly typical of the population. The economic usefulness of the better cattle produced appears to offer opportunities for increasing weaning weights without crossbreeding by up to 10 percent. Rates of gain in the feedlot appear to be increased more in outside comparisons than in those within the station. As for efficiency of feed use, our results are confounded with the problems of time constant comparisons. Many of the faster gaining cattle are ready for market with a shorter feeding period. On a time constant trial these economies are not reflected, and, in general, the group results do not show appreciable savings in feed cost. As for carcass characteristics, the data generally show larger rib eyes, but no higher grade or cut-out values. The larger rib eyes are assumed to be the reflection of the greater size of the cattle at all ages.

# RESUME' OF INBRED AND SELECTION LINES AT FRONT ROYAL[1]

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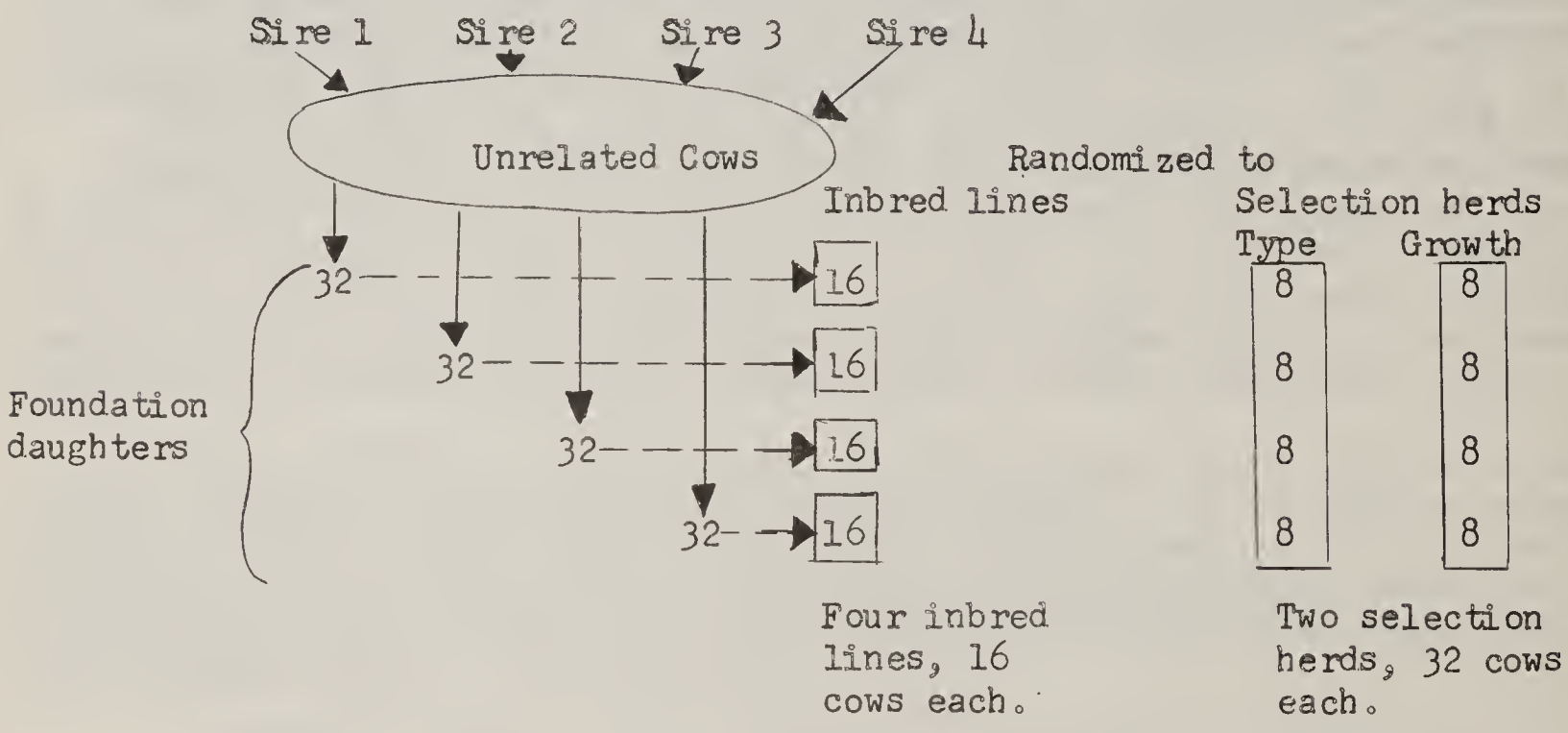
## Introduction.

The Front Royal beef cattle breeding project has been active since 1949. It compares two mating systems, i.e., inbreeding and selection, in three breeds - Angus, Hereford, and Shorthorn. The experimental design, illustrated below, is essentially the same in the three herds under study. The experiment called for performance and progeny testing of several sires in the early years, with retention and extensive subsequent use of those four in each breed having superior records. The four were labeled as "foundation sires" and 32 daughters by each were produced from test cows, then assigned permanently to an inbred, type selection, or growth selection line. Thereafter, the foundation sire was used only within his inbred line.

FOUNDATION SIRES - chosen after individual and/or progeny testing




Time trends occurred in establishing the inbred lines of each breed. Arbitrary line numbers were assigned serially from 1 through 5 to the foundation sires as they were chosen and the same line number was assigned to their inbred progeny. One Hereford and one Shorthorn foundation set was discarded.

Selection lines were begun first in Shorthorns in 1950, next in Angus in 1954, and last in Herefords in 1961. Hereford results are not presented in this report. Additional information on the foundation sires and history of

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[1]Paper presented at the S-10 Technical Committee Meeting, June 21-24, 1964, State College, Mississippi.

the project appear in Virginia Agricultural Experiment Station Bulletin No. 547, entitled "Beef Cattle Research at the Front Royal Station."

Sires used in the selection lines are obtained as yearlings from the annual post-weaning test at the Front Royal station, but are not otherwise restricted regarding their source. Usually two to four bulls of each breed are purchased from outside breeders and placed on the annual test with bull calves from the Front Royal inbred and selection lines. Mild inbreeding in the selection lines occurs when a bull from an inbred line is chosen for service in either the type or growth line. This is a result of coincidental matings to female descendents of their common foundation sire. Inbreeding also occurs when a bull calf produced in a selection line is chosen at the conclusion of the ROP test for service in his own line.

A unique feature of the Front Royal breeding project is that inbreeding and selection are compared simultaneously among descendents from a common genetic base. Observed differences between mating systems are, therefore, not confounded with differences in foundation stock. Selection is much more intense in selection lines than in inbred lines. On the other hand, inbreeding within the inbred lines is much more intense than in selection lines, although neither is zero in either mating system. Certain logical comparisons of response to selection and to inbreeding in both mating systems are discussed below.

Data.

Mating system averages and their respective regressions on inbreeding of calf and of dam are presented from 2049 calves born from 1950-1963 at the Beef Cattle Research Station. Dependent variables are type score and average daily gain at midsummer (approximately 130 days of age) and at weaning (approximately 200 days of age). They are classified at midsummer in two sexes, in three mating systems - inbred, selection, and test - and in two breeds; and at weaning in three sexes, three mating systems, and two breeds. There are, thus, 12 classes at midsummer and 18 in the fall. Limitations of time require that discussion of certain combinations be deferred until later.

Methods.

The data were analyzed within sex, mating system, breed, and season, the latter being midsummer or fall. They are unadjusted for age of dam and year. Certain interactions of potential practical and statistical significance have not been examined. Standard partial regressions presented below are from simultaneous consideration of inbreeding of calf, inbreeding of dam, and days of age.

Results and Discussion.

Tables 1 and 2 present current results, i.e., those of the 1963 calf crop. They contain obvious and familiar differences between mating systems in mortality, reproduction, and calves' type and growth. Current levels of inbreeding in cows and calves are high - 13 to 32 percent in inbreds - when compared with 2 to 3 percent in selection herds. For inbreds, current levels are also much higher than the 4 to 16 percent shown in table 3 which covers the entire time period from 1950 to 1963. This is expected. In contrast, the current 2 to 3 percent inbreeding in Shorthorn selection lines is lower than the 3 to 6 percent for the entire time period, as shown in table 3. The

latter values show the relatively high relationship among Shorthorn cattle transferred to Front Royal from Beltsville in 1949. For Angus, current inbreeding in the selection herds - 2 to 3 percent - is slightly higher than for the entire period from 1950 through 1963.

TABLE 1. Live and stillbirths in Angus and Shorthorn inbred and selection lines, 1963

| Mating system | Born | | Total |
|---|---|---|---|
| | Alive | Dead | |
| Inbred | 106 | 15 | 121 |
| Selection | 127 | 7 | 134 |
| Total: | 233 | 22 | 255 |

$\chi^2 = 4.15^*$, $P < .05$

TABLE 2. Summary of Angus and Shorthorn inbred and selection results for cows' reproduction, calves' type and growth to weaning, 1963[1]

| Mating system | Bd. | N[2] | Inbreeding | | Cows' reproduction | | | | Type | | ADG | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cows | Calves | Percent calf crop | Percent stillbirths | Calves weaned per cow bred | Calves' per calf born | Midsummer | Fall | Midsummer | Fall |
| Inbred | A | 43 | .13 | .24 | 80.6 | 6.9 | .51 | .70 | 10.8 | 11.6 | 1.68 | 1.76 |
| | S | 34 | .17 | .32 | 75.4 | 20.4 | .50 | .71 | 10.4 | 11.5 | 1.54 | 1.66 |
| Av. | | 77 | .15 | .28 | 78.4 | 12.4 | .51 | .70 | 10.6 | 11.6 | 1.62 | 1.72 |
| Selection | A | 57 | .02 | .03 | 86.1 | 4.0 | .72 | .86 | 11.3 | 11.9 | 1.77 | 1.86 |
| | S | 48 | .03 | .03 | 77.5 | 6.7 | .62 | .83 | 11.4 | 12.6 | 1.65 | 1.70 |
| Av. | | 105 | .03 | .03 | 81.8 | 5.2 | .67 | .85 | 11.3 | 12.2 | 1.72 | 1.79 |

[1]Results compiled from 1963 annual report.

[2]Numbers are for midsummer data.

Line Averages. In table 3 are presented unadjusted means for type and growth data on all calves from 1950 through 1963. Results show:

1. Mating system comparisons indicate depression with inbreeding, with selection line differences, i.e., type line minus growth line, being statistically significant

TABLE 3. Unadjusted means for percent inbreeding of dam and of calf, and for midsummer and fall type score and average daily gain

| Class | | | | Inbreeding percent | | Type score | | ADG | |
|---|---|---|---|---|---|---|---|---|---|
| Sex | Breed-Line | Description | N[1] | Dam | Calf | Mids. | Fall | Mids. | Fall |
| Female | A-1,2,3,4 | Inbred | 240 | 3.7 | 10.7 | 11.1 | 11.8 | 1.68 | 1.66 |
| | A-7 | Type | 54 | 1.8 | 2.4 | 11.6 | 12.3 | 1.66 | 1.66 |
| | A-8 | Growth | 75 | .7 | 3.3 | 10.9 | 11.5 | 1.71 | 1.70 |
| | A-9 | Test | 135 | 1.6 | 1.0 | 11.1 | 11.7 | 1.72 | 1.66 |
| | S-1,2,3,4,5 | Inbred | 237 | 9.9 | 15.8 | 10.5 | 11.1 | 1.52 | 1.48 |
| | S-7 | Type | 74 | 5.5 | 2.6 | 10.7 | 11.6 | 1.46 | 1.46 |
| | S-8 | Growth | 109 | 5.7 | 4.0 | 10.5 | 11.3 | 1.55 | 1.52 |
| | S-9 | Test | 100 | 7.6 | 6.3 | 10.2 | 11.2 | 1.56 | 1.52 |
| Male | A-1,2,3,4 | Inbred | 271 | 4.4 | 11.0 | 10.9 | 11.3 | 1.81 | 1.87 |
| | A-7 | Type | 68 | 1.0 | 2.0 | 11.4 | 11.9 | 1.74 | 1.84 |
| | A-8 | Growth | 65 | .6 | 2.6 | 11.1 | 11.4 | 1.91 | 1.98 |
| | A-9 | Test | 108 | 1.7 | .5 | 10.9 | 11.5 | 1.88 | 1.92 |
| | S-1,2,3,4,5 | Inbred | 277 | 10.1 | 14.2 | 10.6 | 10.8 | 1.63 | 1.63 |
| | S-7 | Type | 72 | 5.3 | 3.4 | 10.9 | 11.6 | 1.67 | 1.67 |
| | S-8 | Growth | 81 | 4.7 | 5.1 | 10.5 | 11.1 | 1.64 | 1.73 |
| | S-9 | Test | 83 | 7.0 | 4.9 | 9.8 | 10.8 | 1.64 | 1.65 |
| | Total: | | 2049 | | | | | | |

[1]Numbers of males in fall data are 242, 66, 63, 92, 244, 67, 74, and 75, respectively.

for type in Angus females at midsummer and fall, and for growth in Angus males at midsummer and fall, as shown in table 4.

TABLE 4. Average selection line differences[1]

| | | | Type score[2] | | ADG[3] | |
|---|---|---|---|---|---|---|
| Sex | Breed | N | Mids. | Fall | Mids. | Fall |
| Female | Angus | 129 | .7* | .8* | .05 | .04 |
| | Shorthorn | 183 | .2 | .3 | .09 | .06 |
| Male | Angus | 133 | .3 | .5 | .17* | .14* |
| | Shorthorn | 153 | .4 | .5 | -.03 | .06 |

* $P < .05$

[1]Differences were taken from table 3.
[2]Type line averages minus growth line averages.
[3]Growth line averages minus type line averages.

2. Sex differences in type and growth are similar. Small differences in type at midsummer increase by fall so that females' scores were as good as or better than males' in all cases. For ADG, bulls were slightly faster growing than heifers at midsummer and more so in the fall.

3. Breed differences favor Angus over Shorthorns in all comparisons. Inbred Angus are usually equal to or slightly better than the selected Shorthorns in most cases. Somewhat the converse is true of post-weaning performance, not presented here.

4. From midsummer to fall, mating system differences diminish. This is consistent with knowledge of gradual "recovery" from the depressing effects of inbreeding with time. It was also apparent in table 2, which contained 1963 calf crop results. Perhaps the most debilitating effects of inbreeding occur at birth, or before. Thus, gradual recovery from unfavorable inbreeding effects is the general rule for any inbred calf born alive. Its chances of survival seem to improve with increasing age, at least until weaning.

Regressions. In table 5 are shown the regressions of midsummer and fall type score and average daily gain on percent inbreeding of calf and of dam. Statistical significance as used in this section means that the regressions when tested were different from zero. Reliability of the inbred regressions is distinctly better than for those in selected lines. This is because the range of inbreeding - 0 to 50 percent in the inbred lines - is wider than in the selected lines. There the range is from 0 to 25 percent, but the average is generally less than 5 percent. For this reason, and because numbers were smaller, standard errors of regressions in the selected lines were about 2.5 times as large as those of regressions in the inbred lines.

Some of the following statements concern the number of statistically significant regressions in the various classes of table 5. It is recognized that the attainment or failure of statistical significance of the regression of type or growth on inbreeding is not a wholly adequate measure of the importance of inbreeding. Thus, certain qualifications regarding breed differences in base populations, range of Fx values, consistency of algebraic signs, and absolute values of the regressions should be kept in mind. The following general conclusions seem tenable.

1. Mating system: Effects of inbreeding were clearly more important in inbred than in selection lines. Twenty-four of the 64 regressions in table 5 were statistically significant. Fifteen were from the inbred group, nine in Angus and six in Shorthorns; and nine were from selected lines, two in Angus and seven in Shorthorns. Seven of the nine statistically significant inbred Angus regressions were due to $F_C$ and two to $F_D$. In inbred Shorthorns, $F_D$ and $F_C$ were responsible for three each.

Relative importance of $F_C$ and $F_D$ was not the same in both breeds. Of seven significant regressions on $F_D$, five were from inbred lines, two in Angus and three in Shorthorns. Of 17 significant regressions on $F_C$, ten were from inbred lines and seven from selected lines, the latter all in Shorthorns. Surprisingly, $F_C$ was relatively more important in Angus, but less so in Shorthorns, whereas $F_D$ was important in Shorthorns but less so in Angus. In table 5, $F_C$ is quite important in inbred Angus but not in Angus selected lines; in contrast, $F_D$ was relatively

TABLE 5. Regressions of midsummer and fall type score and average daily gain on percent inbreeding of calf ($F_C$) and of dam ($F_D$)

| Class | | | | Inbreeding percent | | Type score | | | | Average daily gain | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Midsummer | | Fall | | Midsummer | | Fall | |
| Sex | Mating system | Breed | N[1] | Dam | Calf | $F_D$ | $F_C$ | $F_D$ | $F_C$ | $F_D$ | $F_C$ | $F_D$ | $F_C$ |
| Female | Inbred | A | 240 | 3.7 | 10.7 | -.0291* | -.0196* | -.0170 | -.0428** | -.0058* | -.0071** | -.0033 | -.0057** |
| | | S | 237 | 9.9 | 15.8 | -.0397** | .0034 | -.0327* | .0122 | -.0050 | -.0060** | -.0020 | -.0015 |
| | Selection | A | 129 | 1.1 | 2.9 | .0292 | -.0135 | .0423 | -.0044 | .0023 | -.0013 | .0037 | .0015 |
| | | S | 183 | 5.7 | 3.4 | .0032 | -.0520* | -.0189 | -.0897** | .0043 | -.0096 | -.0007 | -.0100* |
| Male | Inbred | A | 271 | 4.4 | 11.0 | -.0233 | -.0002 | -.0046 | -.0252** | -.0043 | -.0068** | -.0027 | -.0069** |
| | | S | 277 | 10.1 | 14.2 | -.0331** | -.0019 | -.0171 | .0073 | -.0036 | -.0066** | -.0023 | -.0055** |
| | Selection | A | 133 | .8 | 2.3 | -.0355 | -.0245 | -.0377 | -.0130 | -.0183* | -.0100 | -.0229** | -.0093 |
| | | S | 153 | 4.7 | 5.1 | -.0247 | -.0709** | -.0196 | .0734** | .0040 | -.0126** | .0028 | -.0160** |

* $P < .05$
** $P < .01$

[1]Numbers of males in fall data are 242, 237, 129, and 141, respectively.

more important in inbred Shorthorns but was nowhere statistically significant in selected Shorthorns.

Because of the relatively low levels of inbreeding within selection lines, the questions: (1) Are the regressions on inbreeding likely to be equal in both inbred and selected lines? and (2) Is the response to inbreeding linear? cannot be answered conclusively at this time. Inspection of table 5 suggests a negative reply to the first question since, between mating systems, regressions differ, but seldom with statistical significance, in both sign and magnitude. To examine the second, a quadratic term for $F_C$ was fitted to midsummer data for type and gain. In four of 16 cases, these regressions were positive and different from zero. Ten of 16 regressions were positive and six were negative.

2. Sex: Heifers' type was more adversely affected by inbreeding than was bulls'. The converse was true of average daily gain.

3. Season: Inbreeding has a slightly larger effect at midsummer than at weaning. This may be seen in terms of the number of significant responses, as well as the slightly larger absolute values at midsummer than at fall for corresponding regressions. This tends to confirm earlier suggestions that there is a gradual "recovery" from the depressing effects of inbreeding.

4. Breed: Inbreeding was relatively more important in Shorthorns than in Angus. For type score, seven of 16 Shorthorn regressions were statistically significant; whereas four of 16 were significant in Angus. For average daily gain, six of 16 were significant in Shorthorns, seven of 16 were significant in Angus. With Shorthorns clearly more highly inbred than Angus, it is somewhat surprising to find nearly as many significant responses in Angus as in Shorthorns. However, these are largely in the inbred lines in the Angus, whereas many more are in selected lines of Shorthorns.

Summary and Conclusions.

Results presented herein are from analyses somewhat approximate (e.g., age of dam and year were ignored), and only recently completed. Differences between selection lines suggest modest changes in the directions expected. Estimates of effects of inbreeding are compatible with gross observations. Further study of results presented here is planned.

# ANALYSIS OF SELECTION AND CROSSBRED DATA[1]

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Techniques for measuring pure genetic response are needed by our present day livestock breeders. These breeders are confronted with the need for making genetic improvement in populations that have been subjected to many generations of selection.

The methods of selection for changing the values of quantitative characters may be classified into two broad categories.

The first group includes a variety of methods which are aimed at changing individual population performance at the expense of additive genetic variance within the population. (Mass selection and family selection) This is known as purebred selection.

The other category includes the methods of selection which are designed to improve hybrid or crossbred performance of lines or populations. This is termed crossbred selection. The genetic variation utilized by crossbred selection is the genetic variance associated with members of the parent population in combination with tester genotypes. It has been suggested by many that the latter techniques should be expanded at the expense of the former.

Thus, the breeder has several programs available and he must choose the system which will accurately and economically yield the greatest genetic gain. Previously, the quantitative genetic theory has given us a method for predicting expected genetic response; however, a valid test rests upon experiments which accurately separate environmental changes from genetic changes during several generations of selection.

There is a great flaw in many of our previous uncontrolled selection experiments due to confounding of genetic with environmental changes during the course of the experiment. The problem of devising adequate genetic controls is a problem in itself and has received much work.

In the analysis of data for most of these selection experiments, we are concerned with either general and/or specific combining ability. According to Sprague and Tatum (1942) general combining ability refers to the average performance of a line in hybrid combinations, while specific combining ability applies to crosses that do relatively better or worse than would be expected on the basis of the average performance of the lines involved. In crosses among unselected lines of corn, these workers found general combining ability to be more important than specific combining ability, which indicated that in such lines genes with additive effects on yield are either more common or produce greater effects than dominant genes or genes with epistatic effects. In contrast, in crosses among inbred lines previously selected for general combining

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[1]Paper presented at the S-10 Technical Committee Meeting, June 21-24, 1964, State College, Mississippi.

ability, the variance for specific combining ability, attributable largely to dominance and epistatic effects, was generally greater than that for additive effects.

Henderson (1948) developed mathematical models and formulas for estimating and testing general, maternal, specific, and sex linkage effects in swine crosses involving multiple classifications with disproportionate sub-class numbers. In his study of eight litter characteristics in single crosses among 12 inbred lines of swine, he found that general combining ability accounted for only 5 percent of the variability among crosses; whereas, from 5 to 15 percent of the variation could be ascribed to specific effects. Neither sex linkage nor mothering ability contributed to the variability among crosses.

Eaton et al. (1950) found that general combining ability was important for individual weight, but not for litter size or litter weight in mice. Other work, mostly in swine, chickens, and laboratory animals, has been reported in the literature: Glazener and Blow (1951), Wyatt (1953), Durham et al. (1954), Dinkel (1955), Magee and Hazel (1959), Hetzer et al. (1961), and Kidwell et al. (1959).

In our own work we have found that general combining ability, maternal and sex-linked effects were all important for weights at 21 and 45 days of age in crosses among inbred lines of mice. In general, the best performing line performed the poorest in crosses.

Maternal effects have been quite large and extend over approximately 60 days. This effect can also be extended to temperament.

Before we go too far and test for these effects, we should determine the use to be made of all effects. For example, single cross data yields information on general combining abilities of the lines, maternal abilities of the lines, specific abilities of the lines with respect to one another, and sex-linkage effects.

Three-way crosses yield information on general combining ability, general combining ability with respect to mothering ability, specific combining ability with respect to performance as single cross females, three-way interaction, and, if desired, the sex-linkage effect with respect to performance as line of dam.

The proper method for utilizing estimates of line and cross-line characteristics of single cross and three-way crosses depends upon what use is to be made of the lines. For example, if on the basis of the single cross test alone, lines are to be selected for use in top-crossing, then select for general combining ability. Some may be interested in selecting for lines to be used as female parents. In this particular case, we must consider genetic effect and maternal ability. Other interest may lie in specific crosses, or the heterosis exhibited by specific crosses.

If we are attempting to develop and test a system of crossbreeding, what information can we use concerning the performance of the breeds or lines themselves to predict the performance of the lines or breeds in crosses? How accurately can the performance of a specific single cross or three-breed cross be predicted from knowledge of the performance of the line, or how useful are single-cross data in predicting three-way crosses?

The answers to these questions have been the subject of much theoretical and applied research in the past few years.

In a majority of cases no matter what questions are of interest, when the data are collected the computational procedures are quite laborious due to the disproportions aspect of the subclass numbers and the total unbalanced aspects of the data.

In order to obtain answers to any of your questions proposed, it is necessary to set up or consider a mathematical model which appears to be a reasonable description of biology involved and which can be treated statistically. Much work on models which are concerned primarily with crossbreeding work has been developed by Henderson and Harvey. We must always keep in mind that these models should be as realistic as possible, and should lend themselves as interpretable in the genetic sense.

For example, consider the following simple model:

$$(1)\quad Y_{ijk} = \mu + g_i + m_j + s_{ij} + r_{ij} + e_{ijk}$$

This model permits us to separate the sources of variability and interpret the effects in terms of genetic parameters.

$g_i$, $g_j$ - is assumed to be one-half of the additive genetic effect or in terms of variances, one-half of the additive genetic variance (breeding value);

$m_j$ - measures the prenatal and postnatal maternal effects and is a reflection of the genotype of the dam;

$s_{ij}$ - is the specific effect (specific combining ability);

$r_{ij}$ - measures the reciprocal or sex-linked effect;

$e_{ijk}$ - is the random environmental effect.

Let us now take a closer look at these effects: (Henderson) $g_i(g_j)$ is an effect common to all progeny of the $i^{th}$ ($j^{th}$) line. $g_i$ can be assumed to be one-half the additive genetic value or breeding value of the $i^{th}$ line. If the number of lines is large and all possible crosses among lines are made, and if the number of progeny per cross is equal and large, the mean of the $i^{th}$ line of the male approaches $\mu + g_i$.

If the maternal effects are zero ($m_j = 0$), the mean of the $i^{th}$ line of dams also approaches $g_i$.

We assume the $g_i$ are normally distributed with mean = 0 and variance $\sigma g^2$. If the lines are random, then $\Sigma g_i g_j = 0$. Since $g_i$ equals one-half the additive genetic value, then variance $g_i$ = one-fourth additive genetic variance.

If there is no selection, then the additive genetic variance among lines is 2f $\sigma g_0^2$ where $\sigma g_0^2$ = the genetic variance of the population from which the lines are formed.

$M_j$ is an effect, in addition to $g_j$ common to all progeny having the $j^{th}$ line as female parent. $M_j$ is an expression of the genotype of the dam and not of the offspring. However, there is a possibility of a correlation between $g_j$ and $m_j$ that is the genotype of the individual and the maternal effects.

A negative covariance $\sigma g_m$ has been reported by Dickerson (1947), Koch and Clark (1955), and Cox et al. (1959). Others reporting an interaction between the genotype of the offspring and the maternal effects of the dam are Rollins et al. (1936), Kidwell et al. (1960), and Harvey et al. (1961). $s_{ij}$ is the specific combining ability effect. It is an effect in addition to the $g_i$ and $m_j$ effects. If all gene action were additive, then $s_{ij}$ would be zero. Either dominance or epistatis or a combination of the two can cause specific effects.

The model just presented was for single crosses where linebreds are not included. After the various parameters have been estimated, we are now able to use these estimates to draw some conclusions concerning our lines. We may be interested in the following questions.

1. What is the most probable value of progeny of males of a tested line when mated to a random sample of females from the same population of line?

2. What is the most probable value of progeny of females of the different tested inbred lines when mated to a random sample of males from the same population of lines?

3. What is the probable value of progeny of a specific cross which has been tested reciprocally?

4. What is the most probable value of progeny of a specific cross which has been tested in only one of the two possible reciprocal crosses?

5. What is the most probable value of a specific cross between two lines which have not been previously tested in crosses with each other?

These questions can be answered from the estimates in the model. If we are interested in a particular cross, $T_{ij}$, and i and j denote the $i^{th}$ line of sire mated to the $j^{th}$ line of dam, then

$$(2)\quad T_{ij} = g_i + g_j + m_j + s_{ij} + r_{ij}.$$

Performance as line of sire is $g_i$,

$$(3)\quad \text{Index} = I = b_i g_i + b_2 m_i$$

because g and m are correlated.

Performance as line of dam,

$$(4)\quad T_{ij} = g_i + m_j$$

Performance of a specific cross (previously tested reciprocally)

(5) $T_{ij} = g_i + g_j + m_j + s_{ij} + r_{ij}$

(6) $T_{ij} = g_i + g_j + m_j + s_{ij}$

Performance of a specific cross not previously tested

(7) $T_{ij} = g_i + g_j + m_j$

In the model previously discussed, we are concerned with crosses where all possible crosses were made between lines but no linebreds were produced.

Another method is an analysis of all data from linebreds and linecrosses produced together, wherein the lirebred effects are estimated independently of the general combining ability and maternal effects.

The third analysis may be of all data from linebreds and linecrosses produced together where the linebred effects are estimated simultaneously with the general combining ability and maternal ability effects.

When it is possible to include the linebreds or purebreds in the design, an estimate of heterosis may be obtained.

The underlying model, as proposed by Harvey, is an follows.

(8) $Y_{hijk} = \mu + a_h + p_{1ii} + g_{2i} + g_{2j} + m_{2j} + c_{2ij} + r_{2ij} + e_{hijk}$

Analysis of data under this model yields estimates of the over-all amount of heterosis and a test of significance of this effect. Heterosis effect of separate crosses may also be obtained.

The previous model can be used to estimate purebred effects by simultaneous consideration of the general combining ability and maternal effects and including these effects in the equation for the purebreds. The model thus becomes:

(9) $Y_{hijk} = \mu = a_h = p_{1ii} + g_{.j} + g_{.i} + m_{.j} + c_{2ij} + r_{21j} + e_{jijk}$

Sire differences within breeds or lines may be an important source of consideration. If more than one sire is used per line per year in a single cross, test estimates of the sire differences and sire by line of dam interaction may be obtained. The model for this analysis is:

(10) $Y_{ijklm} = \mu + g_i + g_j + m_j + s_{ij} + r_{ij} + b_{ik} + b_{lijk} + a_l + e_{ijklm}$

$b_{ik}$ is an effect common to progeny of the $k^{th}$ male of the $i^{th}$ line.

$b_{lijk}$ is an effect common to progeny of crosses of the $k^{th}$ male of the $i^{th}$ line by females of the $j^{th}$ line.

$a_l$ is breed effect.

Two other models presented by Henderson offer some possibilities. These are breed crosses and three-way crosses.

Breed Crosses

Model may be:

(11) $Y_{ijklm} + \mu + a_i + a_j + b_j + c_{ij} + g_{ik} + g_{jl} + m_{jl} + s_{ijkl} + e_{ijklm}$

$a_i(a_j)$ effect common to progeny of the $i^{th}$ ($j^{th}$) breed

$b_j$ effect of breed of dam

$c_{ij}$ effect common to crosses between $i^{th}$ ($j^{th}$) breed

$g_{ik}(g_{jl})$ is an effect common to progeny of the $k^{th}$ line of the $i^{th}$ breed or $l^{th}$ line of the $j^{th}$ breed

$m_{jl}$ is an effect common to progeny of females of $l^{th}$ line of the $j^{th}$ breed

$s_{ijkl}$ is common to crosses g $h^{th}$ line of the $j^{th}$ breed by $l^{th}$ line of the $j^{th}$ breed.

Three-way Crosses

Experimental crosses of this type give data which furnish information concerning general combining ability of lines, general combining ability for maternal ability in single-cross females and three-way interaction of specific combining ability.

Model:

(12) $Y_{ijkl} = \mu + g_i + 1/2g_j + 1/2g_k + 1/2m_j + 1/2m_k + s_{jk} + t_{ijk} + e_{ijkl}$

males of the $i^{th}$ line are mated to females of the cross j x k or k x l

$g_i(g_j, g_k)$ is comparable to the $g_i$ in the single cross model.

$m_j(m_k)$ is comparable to the $m_j$ in the single cross model.

$s_{jk}$ is an effect peculiar to the progeny of a single-cross female of the j x k or k x l line.

$t_{ijk}$ is an effect peculiar to the progeny of the $i^{th}$ line of males by j x h or k x j single-cross females.

General application, such as selection for specific combining ability in outbred populations and in breed crosses, can be made. For example, suppose a number of bulls have been used on a random sample of herds in a state. The record of the progeny of these bulls can be used to estimate general combining ability

of each bull, and variances for bull, farm, and interaction can be estimated. Separate indexes can be constructed for each farm and these used to select semen for each farm. If bull-farm interaction was significant, then the index would differ from farm to farm. The model would be:

$$Y_{ijk} = \mu + b_i + f_j + bf_{ij} + e_{ijk}$$

$b_i$ - sire effect

$f_j$ - farm effect

$bf_{ij}$ - specific sire by farm effect.

The index for selecting a bull for a farm would be:

$$I = a_1\hat{b}_i + a_2\hat{f}_{ij}$$

This index can be extended to selection of a breed cross. The index would be:

$$I = b_1\hat{m}_i + b_2\hat{f}_j + b_3\hat{mf}_{ij}$$

where

$\hat{m}_i$ = performance of i breed as male parent,

$\hat{f}_j$ = performance of $j^{th}$ breed as female parent,

$\hat{mf}_{ij}$ = specific effect.

If $\hat{g}_i$ estimated from top cross data is substituted for $\hat{m}_i$, an index can be constructed for selecting lines to use in top crosses on particular breeds.

These models give us some methods for handling crossbred data.

STATE REPORTS

AUBURN UNIVERSITY
Agricultural Experiment Station

I. PROJECT: Animal Science 525, AHRD Line Project d1-29 (S-10)

The Improvement of the Beef Cattle of Alabama Through Breeding Methods

II. OBJECTIVES:

To determine the effectiveness of mass selection for total performance in beef cattle.

To develop criteria for evaluating and selecting breeding animals.

To study the influence of heterosis in crosses between the three British breeds of beef cattle

III. PERSONNEL:

Troy B. Patterson, George B. Meadows, and W. M. Warren

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of work

Facilities include 950 acres, 600 acres of which are in improved pasture or hay meadows. Paddocks are available for group feeding 150 bulls, 150 heifers, and 100 steers. In addition, lots are available for group feeding sire progeny groups of 40 calves each. A new feed processing unit has been added so that processing of feed for these groups is no longer a problem.

A total of 252 brood calves, 36 replacement heifers, and 20 herd bulls are currently in use on various phases of the project. Of the above females, 173 (75 Angus, 70 Hereford, and 28 Shorthorn) are used on the purebred selection phase. The remaining 79 head (13 Angus, 12 Herefords, 13 Shorthorns, and 41 crossbreds) are used on the crossbreeding phase. The 20 bulls include nine Angus, eight Herefords, and three Shorthorn.

In addition to the above, 165 grade cows of predominately Hereford breeding, which are located at two substations, are used in support of the research at the main station.

2. Research results

The long generation interval in cattle has limited the out-put of this experiment in terms of new and significant results. Because of the effects of uncontrolled environmental influence, several generations are required to accurately evaluate a selection procedure. Only a limited number of second and third generation females are in production at present,

while the largest part of the herd is made up of foundation cows and their daughters. Young bulls saved from the herd offer potential for rapid improvement. Also, comparisons are being made between bulls raised on the station and bulls purchased from various breeders.

Data collected on the calves in the purebred herds include birth weight, 180-day weight and score, 250-day weight and score, post-weaning performance, and conformation score at the end of the post-weaning test. Heifer replacement selection is based on an index giving equal emphasis to weaning weight, post-weaning gain, and conformation score.

Five years of data have been completed for the first phase of the crossbreeding study. These data are presented in table 1 for steer calves and in table 2 for the heifers. These data are presented in separate tables because they are not additive, with the exception of weaning weights which have been adjusted to steer equivalents. After weaning, the heifers were placed on a growing ration for 129 days. The steers were full-fed for 222 days on a finishing ration. Tenderness data are available for the last three years of the test. There was no difference between purebreds and crossbreds in tenderness, as determined by the Warner-Bratzler shear, expressed in pounds per square inch. The value for purebreds was 16.5 lbs./sq. in., and for crossbreds it was 16.8 lbs./sq. in. There appears to be more difference between breeds than between breed crosses, despite the fact that the crosses were fatter and graded slightly higher.

The reproductive performance, by breed of sire and breed of dam, are presented in table 3. A summary comparing purebred and crossbred calf crop percentage is included.

A limited amount of data is available on the second phase, which is a comparison of two-way and three-way cross steers. These data are presented in table 4. Since both groups are crossbreds and have the same degree of heterosis in the calves, any differences will be due to heterosis in the dam and/or random differences. With the few numbers, no conclusions will be made at present.

A total of twelve 140-day post-weaning performance tests have been completed. During the first 10 years, a total of 517 bulls completed the test, with an average daily gain of 2.24 pounds and a weight per day of age of 2.06 pounds. During the last two years, 139 bulls completed the test, with an average daily gain of 2.42 pounds and a weight per day of age of 2.29 pounds. There are 87 bulls currently on test. These bulls have a 112-day average of 2.27 pounds. Bulls with definite superior gaining ability are being tested at present. Buyer acceptance is indicated by results over the last four years. The top third of the bulls gained an average of 2.73 pounds daily, compared to the low third with 2.14 pounds daily. These bulls brought an average of $775 and $475, respectively. The weight per day of age was also considered in buying bulls. The top third had a weight per day of age of 2.46 pounds and brought an average of $767 per head, as compared with 2.09 pounds and $482 per head for the lower third.

TABLE 1. Crossbreeding Results, Steer Data
Five Years (1957-1961)

| Breeding group | No. steers | Adj. weaning weight | Weaning grade | Feed-lot ADG | Final weight (shrunk) | Chilled carcass weight | Federal carcass grade | Fat thick-ness | Adj. rib eye/ 100 lbs. carcass | Dressing percent |
|---|---|---|---|---|---|---|---|---|---|---|
| Angus | 17 | 473.2 | 10.4 | 1.84 | 923.3 | 569.3 | 13.1 | 0.66 | 2.14 | 61.6 |
| Hereford | 22 | 432.3 | 9.7 | 1.95 | 894.4 | 534.1 | 11.4 | 0.62 | 2.16 | 59.7 |
| Shorthorn | 20 | 431.4 | 9.8 | 2.01 | 892.6 | 541.8 | 12.2 | 0.56 | 2.17 | 60.7 |
| Average | 59 | 443.7 | 9.9 | 1.94 | 902.1 | 546.8 | 12.2 | 0.61 | 2.16 | 60.6 |
| A x S | 7 | 456.0 | 9.3 | 2.03 | 954.8 | 588.4 | 12.9 | 0.74 | 2.20 | 61.6 |
| S x A | 17 | 484.1 | 10.2 | 1.91 | 979.4 | 602.7 | 13.6 | 0.68 | 2.10 | 61.5 |
| Average | 24 | 475.9 | 9.9 | 1.94 | 972.2 | 598.5 | 13.4 | 0.70 | 2.13 | 61.6 |
| A x H | 5 | 471.4 | 9.4 | 2.13 | 977.0 | 605.4 | 12.6 | 0.76 | 2.07 | 62.0 |
| H x A | 12 | 481.6 | 10.8 | 1.94 | 962.6 | 588.1 | 12.4 | 0.71 | 2.24 | 61.1 |
| Average | 17 | 478.6 | 10.4 | 2.00 | 966.8 | 593.1 | 12.5 | 0.72 | 2.19 | 61.3 |
| H x S | 10 | 511.8 | 10.2 | 2.10 | 1022.9 | 634.9 | 12.7 | 0.71 | 2.12 | 62.1 |
| S x H | 12 | 479.9 | 10.2 | 2.08 | 1017.0 | 621.2 | 12.6 | 0.73 | 2.08 | 61.1 |
| Average | 22 | 494.4 | 10.2 | 2.09 | 1019.6 | 627.4 | 12.6 | 0.72 | 2.10 | 61.5 |
| Av. all crossbreds | 63 | 483.0 | 10.1 | 2.01 | 987.2 | 607.1 | 12.9 | 0.71 | 2.14 | 61.5 |
| Difference | | 39.3 | 0.2 | 0.07 | 85.1 | 60.3 | 0.7 | 0.10 | 0.02 | 0.9 |

TABLE 2. Crossbreeding Results, Heifer Data
Five Years (1957-1961)

| Breeding group | No. heifers | Adj. weaning weight | ADG on test | Conformation score |
|---|---|---|---|---|
| Angus | 27 | 470 | 1.70 | 11.7 |
| Hereford | 17 | 491 | 1.79 | 11.9 |
| Shorthorn | 18 | 469 | 1.87 | 12.0 |
| Average | 62 | 475 | 1.77 | 11.9 |
| A x H | 9 | 468 | 1.82 | 10.9 |
| H x A | 10 | 520 | 1.82 | 12.4 |
| Average | 19 | 496 | 1.82 | 11.7 |
| A x S | 12 | 473 | 1.74 | 11.8 |
| S x A | 8 | 510 | 1.70 | 11.9 |
| Average | 20 | 488 | 1.73 | 11.8 |
| H x S | 9 | 514 | 1.77 | 11.7 |
| S x H | 8 | 515 | 1.66 | 12.4 |
| Average | 17 | 515 | 1.72 | 12.0 |
| Av. all crossbreds | 56 | 499 | 1.76 | 11.8 |
| Difference | - 6 | 24 | -0.01 | - 0.1 |

From 50 to 100 heifers are tested annually, and replacements for the experimental herds are selected from these animals.

In support of the main project, studies have been carried out at two locations - Tuskegee Field and the Upper Coastal Plain Substation - to test the effectiveness of selection based performance test. Weaning weight and post-weaning data are complete for the two locations for four years and are presented in table 5. In only one year out of the four at one location did the progeny from the low-weaning weight sires wean heavier than those sired by the high-gaining sire.

3. Conclusions

Crossbred steers weaned heavier, gained faster, and produced heavier carcasses which graded higher than purebred steers.

When finished in a uniform feeding period, the crossbred steers were fatter, but there was no difference in meatiness or tenderness, as measured by rib-eye area per 100 pounds of carcass and Warner-Bratzler shear, respectively.

TABLE 3. Reproduction Among Cows on Crossbreeding

| Reproductive trait | Breed of dam: Angus — Breed of sire A | Angus — H | Angus — S | Hereford — A | Hereford — H | Hereford — S | Shorthorn — A | Shorthorn — H | Shorthorn — S |
|---|---|---|---|---|---|---|---|---|---|
| Number exposed | 59 | 30 | 30 | 29 | 60 | 30 | 30 | 29 | 59 |
| Number calving | 51 | 23 | 27 | 21 | 43 | 24 | 20 | 19 | 45 |
| No. calves born dead | 3 | 0 | 1 | 2 | 2 | 0 | 2 | 0 | 2 |
| No. calves died after birth | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 |
| No. calves weaned | 47 | 23 | 25 | 18 | 41 | 24 | 17 | 19 | 43 |
| No. cows died calving | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Percent cows calving | 86.4 | 76.7 | 90.0 | 72.4 | 71.7 | 80.0 | 66.7 | 65.5 | 76.3 |
| Percent calves weaned | 79.7 | 76.7 | 83.3 | 62.1 | 68.3 | 80.0 | 56.7 | 65.5 | 72.9 |

| | Calf Crop by Breed of Dam: Angus | Hereford | Shorthorn |
|---|---|---|---|
| Percent cows calving | 84.9 | 73.9 | 71.2 |
| Percent calves weaned | 79.8 | 69.7 | 66.9 |

| | Calf Crop by Breed of Sire: Angus | Hereford | Shorthorn |
|---|---|---|---|
| Percent cows calving | 78.0 | 71.4 | 80.7 |
| Percent calves weaned | 69.5 | 69.7 | 77.3 |

| | Calf Crop by Breeding Groups: Purebreds | Crossbreds |
|---|---|---|
| Percent cows calving | 78.1 | 75.3 |
| Percent calves weaned | 73.6 | 70.8 |

TABLE 4. Two-way vs. Three-way Cross Steers and Heifers
(Two-year average)

| | Number | Birth weight | Adj. weaning weight | Conformation score |
|---|---|---|---|---|
| Three-way cross | 24 | 67.0 | 472.1 | 8.7 |
| Two-way cross | 16 | 68.8 | 448.1 | 8.0 |
| Difference | - | - 1.8 | 24.0 | 0.7 |
| Three-way cross | 18 | 60.6 | 484.2 | 8.4 |
| Two-way cross | 15 | 59.7 | 482.0 | 7.9 |
| Difference | - | 0.9 | 2.2 | 0.5 |

TABLE 5. Comparison of Progeny from High and Medium-Gaining Bulls
Four Years (1959-1962)
Upper Coastal Plain Substation, Winfield

| | | | | Birth to weaning | | | Pasture (93 days) | | Feed lot | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Class | No. bulls | No. calves | Birth wt., lb. | Adj. weaning wt., lb. | Sl. grade | ADG lb. | Grade, feeder | Final wt., lb. | ADG lb. | Wt./ day age, lb. | Carcass grade, federal | Dollar value |
| 1959- | H | 2 | 23[1] | 61.4 | 534.8 | 8.2 | 0.56 | 9.5 | 855.0 | 1.76 | 1.49 | 10.8 | 206.51 |
| 1961 | M | 2 | 26 | 58.1 | 515.6 | 8.7 | 0.56 | 10.2 | 771.5 | 1.47 | 1.38 | 10.3 | 186.97 |
| | Dif. | - | - 3 | 3.3 | 19.2 | -0.5 | 0.00 | - 0.7 | 83.5 | 0.29 | 0.11 | 0.5 | 19.54 |
| 1960- | H | 2 | 36[2] | 62.0 | 525.5 | 7.4 | 0.68 | 7.2 | 835.0 | 2.00 | 1.61 | 10.0 | 206.18 |
| 1962 | M | 2 | 32 | 56.5 | 482.5 | 7.0 | 0.62 | 6.9 | 810.0 | 2.03 | 1.51 | 10.4 | 204.20 |
| | Dif. | - | 4 | 5.5 | 43.0 | 0.4 | 0.06 | 0.3 | 25.0 | - .03 | 0.10 | - 0.4 | 1.98 |
| 1961- | H | 2 | 39 | 64.3 | 508.9 | 7.2 | 0.52 | 10.2 | 831.9 | 2.20 | 1.56 | 10.0 | 170.98 |
| 1963 | M | 2 | 33 | 64.1 | 522.4 | 7.8 | 0.45 | 10.0 | 820.7 | 2.11 | 1.56 | 9.9 | 170.91 |
| | Dif. | - | 6 | 0.2 | - 13.5 | -0.6 | 0.07 | 0.2 | 11.2 | 0.09 | 0.00 | 0.1 | 0.07 |
| 1962- | H | 2 | 39 | 61.4 | 519.8 | 9.2 | 0.89 | 9.0 | 811.4 | 1.60 | 1.51 | 11.4 | 171.47 |
| 1964 | M | 2 | 34 | 58.0 | 475.1 | 9.1 | 0.82 | 8.4 | 745.4 | 1.57 | 1.42 | 11.1 | 162.30 |
| | Dif. | - | 5 | 3.4 | 44.7 | 0.1 | 0.07 | 0.6 | 66.0 | 0.03 | 0.09 | 0.3 | 9.17 |
| Av., | H | 8 | 137[3] | 62.4 | 520.7 | 8.0 | 0.67 | 9.0 | 829.3 | 1.89 | 1.54 | 10.6 | 189.08 |
| 4 years | M | 8 | 125 | 59.2 | 497.9 | 8.1 | 0.62 | 8.8 | 787.2 | 1.81 | 1.47 | 10.4 | 179.48 |
| | Dif. | - | 12 | 3.2 | 22.8 | 0.1 | 0.05 | 0.2 | 42.1 | 0.08 | 0.07 | 0.2 | 9.60 |

1 - only 19 were finished in feedlot.
2 - only 20 were finished in leedlot.
3 - only 117 were finished in feedlot.

Crossbred heifers weaned heavier than purebred heifers. However, there was no difference in post-weaning performance between the two breeding groups.

Two years of data with limited numbers suggests that crossbred dams are more superior mother cows than are purebred dams. As was true in the first phase, there is a greater difference between two-way and three-way cross steers than between two-way and three-way cross heifers.

Performance of bulls on test continues to increase. Breeders buying bulls to go on commercial herds have consistently paid higher prices for bulls with higher gain on test and higher weight per day of age. Research at two locations indicates that these buyers are justified in paying the higher prices for the better-performing bulls, based on weaning weight of tested progeny and their post-weaning performance.

## V. FUTURE PLANS:

The project will be revised. The crossbreeding work will be continued through the second phase, and a third phase will be conducted, if a suitable location can be found.

## VI. PUBLICATIONS DURING THE YEAR:

Patterson, T. B. 1963. Crossbreeding compared among British breeds. Highlights of Agricultural Research, Vol. 10, No. 4. 1963.

## VII. PUBLICATIONS PLANNED:

None

Submitted by: T. B. Patterson

I. PROJECT: Animal Science 525-1 (S-10)

A Comparison of Crossbreeding and Within Breed Selection on Beef Cattle Production in the Black Belt Area of Alabama

II. OBJECTIVES:

To evaluate the significance of hybrid vigor in various crosses of beef cattle with regard to production of slaughter calves, stocker or feeder steers, and slaughter steers.

To determine the effect of heterosis on mothering ability, adaptability, and fertility.

To determine the most economical method of finishing steer calves that are dropped in the spring from the above system.

III. PERSONNEL:

Troy B. Patterson, L. A. Smith, and Harold Grimes

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of the work

Sixty brood cows, 20 of which are first-cross Brahman x Herefords, and 40 of which are high-grade Herefords, have been devoted to the first phase of this test. Since these were mature cows initially, several have been removed under standard management procedures. Whenever possible, cows of similar breeding have been used as replacements. Despite this effort, fewer numbers were available for the last two years of the test. Matings were made to produce approximately equal numbers of Hereford, Angus x Hereford, and 3/4 Hereford-1/4 Brahman calves.

Randomly selected females from these breeding groups were retained for use in the second phase of the study. These heifers are being bred as follows:

| Bull | Cow | Offspring |
|---|---|---|
| Hereford | Hereford | Hereford |
| Hereford | 1/2 A-1/2 H | 3/4 H-1/4 A |
| Angus | 1/2 A-1/2 H | 3/4 A-1/4 H |
| Hereford | 3/4 H-1/4 Br | 7/8 H-1/8 Br |

In addition to weaning information on all calves, post-weaning performance and carcass evaluations are being obtained on all steers.

2. Research results

Data collected over the first five years of this study were reported in last year's annual report. These data completed the first phase.

Limited data covering a three-year period are available on the second phase, and are shown in table 1. These data cover only the birth to weaning period, as the current group of steers has not completed the feedlot phase.

The last set of heifers on the second phase are being bred to calve as two-year-olds this fall, and will enter the test next year. Approximately 10 years' data will be needed to properly evaluate the performance of the crossbred dams.

No further work is anticipated with reference to the third objective. The data collected for this study were reported in detail in a previous report.

3. Conclusions

Crossbred cows weaned heavier calves, which graded higher and returned more gross dollars per head than did purebred cows. All crossbred cow groups produced higher percent calf crops than did the purebred cows. Hereford backcross calves (H x AH) were superior to Angus backcross calves (A x AH) in all respects except market grade, which was reflected in a higher market price per hundredweight. Both Hereford and Angus backcross calves were superior to the Hereford x Brahman-Hereford backcross calves. However, the latter comparison is not completely legitimate, as a first backcross is being compared to a second backcross.

TABLE 1. Comparison of Hereford, 7/8 Hereford-1/8 Brahman, 3/4 Hereford-1/4 Angus, and 3/4 Angus-1/4 Hereford Calves - 2nd Phase Crossbreeding Experiment - 3-Year Average, Black Belt Substation (1960-61, 1961-62, 1962-63)

| Breed | Calves | ADG | Corr. mkt. wt. | Mkt. price $/cwt. | Corr. mkt. value | Sl. grade | Grade | Calf crop |
|---|---|---|---|---|---|---|---|---|
| Hereford | 39 | 1.60 | 473.9 | 24.25 | 114.91 | 9.0 | 11.1 | 76.5 |
| 3/4H-1/4A | 23 | 1.79 | 522.5 | 24.10 | 125.90 | 10.2 | 11.4 | 88.5 |
| 3/4A-1/4H | 22 | 1.73 | 506.0 | 24.49 | 123.92 | 10.5 | 11.9 | 84.6 |
| 7/8A-1/8Br. | 40 | 1.70 | 501.4 | 24.02 | 120.45 | 9.4 | 10.9 | 82.4 |
| Advantage over Hereford | | | | | | | | |
| 3/4H-1/4A | | 0.19 | 48.6 | - 0.15 | 10.99 | 1.2 | 0.3 | 12.0 |
| 3/4A-1/4H | | 0.13 | 32.1 | 0.24 | 9.01 | 1.5 | 0.8 | 8.1 |
| 7/8H-1/8Br. | | 0.10 | 27.5 | - 0.23 | 5.54 | 0.4 | - 0.2 | 5.9 |

V. FUTURE PLANS:

The second phase will be continued for the life of the brood cows included in this study.

VI. PUBLICATIONS DURING THE YEAR:

Station mimeograph

VII. PUBLICATIONS PLANNED:

Station bulletin

Submitted by: T. B. Patterson

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-63)

Alabama State

| Location | Auburn | Auburn | Auburn | Auburn | Auburn | Auburn |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Hereford | Shorthorn | Angus | Angus | Hereford |
| Breed of dam | Angus | Hereford | Shorthorn | Hereford | Shorthorn | Angus |
| Line or group[1] | Purebred | Purebred | Purebred | Cross-breeding | Cross-breeding | Cross-breeding |
| No. cows exposed[2] | 49 | 45 | 15 | 18 | 10 | 13 |
| No. calves born[3] | 39 | 35 | 12 | 16 | 8 | 12 |
| Calving percent, born | 79.6 | 77.8 | 80.0 | 88.9 | 80.0 | 92.3 |
| Av. birth date | 11-07-62 | 12-09-62 | 11-25-62 | 11-06-62 | 11-20-62 | 11-08-62 |
| Av. birth wt. | 53.1 | 66.8 | 62.4 | 64.6 | 59.1 | 69.0 |
| No. calves weaned | 39 | 32 | 11 | 15 | 7 | 12 |
| Calving percent, weaned[4] | 79.6 | 71.1 | 73.3 | 83.3 | 70.0 | 92.3 |
| Av. weaning age, days | 250 | 250 | 250 | 250 | 250 | 250 |
| Adj. ADG[5] | 1.80 | 1.52 | 1.54 | 1.55 | 1.65 | 1.63 |
| Av. type sc.[6] | 11.9 | 12.5 | 12.4 | 12.0 | 11.8 | 12.2 |
| Av. cond. sc.[6] | 7.3 | 7.6 | 8.4 | 8.2 | 8.3 | 8.7 |

1 - Purebreds, grade, line, backcross, three-breed cross, trestment, etc.
2 - Total number put in breeding herd
3 - Total number born, dead + alive
4 - Number weaned, divided by number of cows exposed
5 - Indicate adjustments:

Mature dam
Steer equivalent
All weaned at 250 days

6 - 15, 16, and 17 = Fancy
12, 13, and 14 = Choice
9, 10, and 11 = Good
6, 7, and 8 = Medium

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-63)

Alabama State

| Location | Auburn | Auburn | Auburn | Auburn | Auburn | Auburn |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Shorthorn | Shorthorn | Angus | Angus | Hereford |
| Breed of dam | Shorthorn | Angus | Hereford | H x S | S x H | A x S |
| Line or group[1] | Cross-breeding | Cross-breeding | Cross-breeding | Cross-breeding | Cross-breeding | Cross-breeding |
| No. cows exposed[2] | 13 | 19 | 10 | 4 | 7 | 7 |
| No. calves born[3] | 12 | 19 | 8 | 4 | 5 | 4 |
| Calving percent, born | 92.3 | 100.0 | 80.0 | 100.0 | 71.4 | 57.1 |
| Av. birth date | 11-05-62 | 10-31-62 | 11-14-62 | 11-14-62 | 10-27-62 | 11-12-62 |
| Av. birth wt. | 69.9 | 58.9 | 66.7 | 62.2 | 62.0 | 63.8 |
| No. calves weaned | 12 | 16 | 7 | 4 | 4 | 4 |
| Calving percent, weaned[4] | 92.3 | 84.2 | 70.0 | 100.0 | 57.1 | 57.1 |
| Av. weaning age, days | 250 | 250 | 250 | 250 | 250 | 250 |
| Adj. ADG[5] | 1.56 | 1.57 | 1.54 | 1.62 | 1.84 | 1.63 |
| Av. type sc.[6] | 12.2 | 11.4 | 11.3 | 11.0 | 12.0 | 13.0 |
| Av. cond. sc.[6] | 7.8 | 7.9 | 7.4 | 9.0 | 10.0 | 10.0 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd
3 - Total number born, dead + alive
4 - Number weaned, divided by number of cows exposed
5 - Indicate adjustments:

mature dam
steer equivalent
all weaned at 250 days

6 - 15, 16, and 17 = Fancy
12, 13, and 14 = Choice
9, 10, and 11 = Good
6, 7, and 8 = Medium

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-63)

Alabama State

| Location | Auburn | Auburn | Auburn | Blackbelt | Blackbelt | Blackbelt |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Shorthorn | Shorthorn | Hereford | Hereford | Angus |
| Breed of dam | S x A | A x H | H x A | Hereford | A x H | A x H |
| Line or group[1] | Cross-breeding | Cross-breeding | Cross-breeding | Cross-breeding | Cross-breeding | Cross-breeding |
| No. cows exposed[2] | 4 | 3 | 5 | 25 | 11 | 13 |
| No. calves born[3] | 2 | 3 | 5 | 18 | 10 | 11 |
| Calving per-cent, born | 50 | 100 | 100 | 72.0 | 90.9 | 84.6 |
| Av. birth date | 10-26-62 | 10-25-62 | 10-29-62 | 11-17-62 | 11-28-62 | 12-01-62 |
| Av. birth wt. | 75.5 | 71.3 | 61.4 | 66.9 | 65.6 | 64.5 |
| No. calves weaned | 2 | 3 | 5 | 16 | 10 | 10 |
| Calving per-cent, weaned[4] | 50 | 100 | 100 | 64.0 | 90.9 | 76.9 |
| Av. weaning age, days | 250 | 250 | 250 | 255 | 255 | 255 |
| Adj. ADG[5] | 1.71 | 1.48 | 1.49 | 1.71 | 1.92 | 1.86 |
| Av. type sc. | 12.0 | 13.0 | 11.3 | 12.0 | 12.3 | 12.6 |
| Av. cond. sc. | 8.5 | 8.0 | 8.0 | 10.1 | 11.3 | 11.6 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd
3 - Total number born, dead + alive
4 - Number weaned, divided by number of cows exposed
5 - Indicate adjustments:

Mature dam
Steer equivalent
Auburn cattle weaned at 250 days; Blackbelt at 255

6 - 15, 16, and 17 = Fancy
12, 13, and 14 = Choice
9, 10, and 11 = Good
6, 7, and 8 = Medium

FORM I
COW PROUDCTION, 1963 CALF CROP (1962-63)

Alabama State

| Location | Blackbelt | Winfield | Winfield | Winfield | Winfield | |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Angus | Angus | Hereford | Hereford | |
| Breed of dam | 3/4H-1/4Br | Mixed | Mixed | Mixed | Mixed | |
| Line or group[1] | Cross-breeding | High | Low | High | Low | |
| No. cows exposed[2] | 27 | 23 | 19 | 22 | 21 | |
| No. calves born[3] | 18 | 23 | 17 | 20 | 17 | |
| Calving per-cent, born | 66.7 | 100 | 89.5 | 90.9 | 81.0 | |
| Av. birth date | 11-18-62 | 10-17-62 | 10-12-62 | 10-13-62 | 10-20-62 | |
| Av. birth wt. | 70.3 | 58.8 | 55.1 | 64.4 | 61.0 | |
| No. calves weaned | 18 | 23 | 17 | 20 | 17 | |
| Calving per-cent, weaned[4] | 66.7 | 100.0 | 89.5 | 90.9 | 81.0 | |
| Av. weaning age, days | 255* | 289** | 294** | 293** | 286** | |
| Adj. ADG[5] | 1.83 | 1.50 | 1.38 | 1.56 | 1.40 | |
| Av. type sc.[6] | 12.1 | - | - | - | - | |
| Av. cond. sc.[6] | 10.8 | 8.8 | 9.2 | 9.8 | 8.9 | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd
3 - Total number born, dead + alive
4 - Number weaned, divided by number of cows exposed
5 - Indicate adjustments:

Mature Dam
Steer equivalent
*255 days age, **300 days weaning

6 - 15, 16, and 17 = Fancy
12, 13, and 14 = Choice
9, 10, and 11 = Good
6, 7, and 8 = Medium

# FORM II
## POST-WEANING PERFORMANCE OF CALVES FED IN 1963

Alabama State

| | Location | Auburn | Auburn | Auburn | Auburn | Auburn | Auburn |
|---|---|---|---|---|---|---|---|
| | Breed of sire | Angus | Hereford | Shorthorn | Angus | Hereford | P.Hereford |
| | Breed of dam | Angus | Hereford | Shorthorn | Angus | Hereford | P.Hereford |
| | Line or group[1] | P.B. Sta. | P.B. Sta. | P.B. Sta. | P.B. Coop. | P.B. Coop. | P.B. Coop. |
| Bulls | No. in group | 16 | 13 | 4 | 21 | 22 | 25 |
| | Feed regime[2] | | | | | | |
| | Av. init. age | 353 | 336 | 316 | 331 | 363 | 301 |
| | Av. init. wt. | 654 | 609 | 554 | 733 | 803 | 670 |
| | Av.no.da.fed | 140 | 140 | 140 | 140 | 140 | 140 |
| | Av. final wt. | 957 | 995 | 896 | 1053 | 1143 | 1006 |
| | ADG on test | 2.16 | 2.76 | 2.45 | 2.29 | 2.30 | 2.40 |
| | Av. type sc. | 12.5 | 12.3 | 12.5 | 12.1 | 12.7 | 12.6 |
| | Av. cond. sc. | | | | | | |
| | Av. inbreeding | 0 | 0 | 0 | 0 | 0 | 0 |
| Heifers | No. in group | 20 | 14 | 6 | | | |
| | Feed regime[2] | | | | | | |
| | Av. init. age | 337 | 302 | 334 | | | |
| | Av. init. wt. | 475 | 427 | 442 | | | |
| | Av.no.da.fed | 130 | 130 | 130 | | | |
| | Av. final wt. | 712 | 664 | 670 | | | |
| | ADG on test | 1.82 | 1.82 | 1.72 | | | |
| | Av. type sc. | 12.6 | 12.7 | 12.3 | | | |
| | Av. cond. sc. | | | | | | |
| | Av. inbreeding | 0 | 0 | 0 | | | |
| Steers | No. in group | 3 | 5 | 4 | | | |
| | Feed regime[2] | | | | | | |
| | Av. init.age | 334 | 333 | 348 | | | |
| | Av. init. wt. | 491 | 464 | 457 | | | |
| | Av.no.da.fed | 214 | 214 | 214 | | | |
| | Av. final wt. | 923 | 891 | 894 | | | |
| | ADG on test | 2.02 | 2.00 | 2.04 | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | 15.3 | 11.2 | 12.0 | | | |
| | Av. inbreeding | 0 | 0 | 0 | | | |

1 - Show whether station-owned or cooperator-owned, in addition to other group designation.

2 - Feed regime:

| | Bulls | | Heifers | | Steers | |
|---|---|---|---|---|---|---|
| How fed - full, limited, etc. | Full | | Full | | Full | |
| Pounds/day over feeding period | | | | | | |
| Ration: | Gr. sn. corn | 58.0* | Gr. sn. corn | 31.5* | Gr. sn. corn | 58.0* |
| | Molasses | 6.0 | Molasses | 7.0 | Molasses | 6.0 |
| *All ration ingrediants are expressed as percents. | CSM | 9.5 | CSM | 10.0 | CSM | 9.5 |
| | Alfalfa meal | 3.0 | Alfalfa meal | 5.0 | Alfalfa meal | 5.0 |
| | CS hulls | 12.5 | CS hulls | 30.0 | CS hulls | 12.5 |
| | J'songrass hay | 9.5 | J'songrass hay | 15.0 | J'songrass hay | 9.5 |
| | Salt | 1.0 | Salt | 1.0 | Salt | 1.0 |
| | CDP | 0.5 | CDP | 0.5 | CDP | 0.5 |

# FORM II
## POST-WEANING PERFORMANCE OF CALVES FED IN 1963

Alabama State

| | | | | | | |
|---|---|---|---|---|---|---|
| Location | Auburn | Auburn | Auburn | Auburn | Auburn | Auburn |
| Breed of sire | Charbray | Angus | Angus | Hereford | Hereford | Hereford |
| Breed of dam | Chrabray | Hereford | Shorthorn | Angus | Shorthorn | Angus |
| Line or group[1] | P.B. Coop | C'breeding | C'breeding | C'breeding | C'breeding | C'breeding |
| Bulls: No. in group | 5 | | | | | |
| Bulls: Feed regime[2] | | | | | | |
| Bulls: Av. init.age | 300 | | | | | |
| Bulls: Av. init. wt. | 740 | | | | | |
| Bulls: Av.no.da.fed | 140 | | | | | |
| Bulls: Av. final wt. | 1078 | | | | | |
| Bulls: ADG on test | 2.49 | | | | | |
| Bulls: Av. type sc. | 12.7 | | | | | |
| Bulls: Av. cond. sc. | | | | | | |
| Bulls: Av. inbreeding | 0 | | | | | |
| Heifers: No. in group | | 5 | 6 | 6 | 4 | 5 |
| Heifers: Feed regime[2] | | | | | | |
| Heifers: Av. init. age | | 336 | 336 | 357 | 357 | 352 |
| Heifers: Av. init. wt. | | 475 | 455 | 489 | 470 | 497 |
| Heifers: Av.no.da.fed | | 130 | 130 | 130 | 130 | 130 |
| Heifers: Av. final wt. | | 712 | 715 | 711 | 745 | 747 |
| Heifers: ADG on test | | 1.82 | 2.00 | 1.71 | 2.11 | 1.97 |
| Heifers: Av. type sc. | | 12.0 | 12.8 | 12.0 | 12.8 | 12.2 |
| Heifers: Av. cond sc. | | | | | | |
| Heifers: Av. inbreeding | | 0 | 0 | 0 | 0 | 0 |
| Steers: No. in group | | 1 | 1 | 4 | 5 | 5 |
| Steers: Feed regime[2] | | | | | | |
| Steers: Av. init. age | | 430 | 376 | 385 | 391 | 371 |
| Steers: Av. init. wt. | | 505 | 620 | 554 | 530 | 540 |
| Steers: Av.no.da.fed | | 237 | 214 | 214 | 204 | 214 |
| Steers: Av. final wt. | | 970 | 1080 | 1000 | 986 | 962 |
| Steers: ADG on test | | 1.96 | 1.83 | 2.08 | 2.29 | 1.97 |
| Steers: Av. type sc. | | | | | | |
| Steers: Av. cond. sc. | | 14.0 | 13.0 | 13.0 | 12.6 | 14.6 |
| Steers: Av. inbreeding | | 0 | 0 | 0 | 0 | 0 |

1 - Show whether station-owned or cooperator-owned, in addition to other group designation.

2 - Feed regime

| | Bulls | | Heifers | | Steers | |
|---|---|---|---|---|---|---|
| How fed - full, limited, etc. | Full | | Full | | Full | |
| Pounds/day over feeding period | | | | | | |
| Ration: | Gr. sn. corn | 58.0* | Gr. sn. corn | 31.5* | Gr. sn. corn | 58.0* |
| | Molasses | 6.0 | Molasses | 7.0 | Molasses | 6.0 |
| | CSM | 9.5 | CSM | 10.0 | CSM | 9.5 |
| *All ration ingrediants are expressed as percents. | Alfalfa meal | 3.0 | Alfalfa meal | 5.0 | Alfalfa meal | 3.0 |
| | CS hulls | 12.5 | CS hulls | 30.0 | CS hulls | 12.5 |
| | J'songrass hay | 9.5 | J'songrass hay | 15.0 | J'songrass hay | 9.5 |
| | Salt | 1.0 | Salt | 1.0 | Salt | 1.0 |
| | CDP | 0.5 | CDP | 0.5 | CDP | 0.5 |

# FORM II
# POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Alabama State

| | | | | | | |
|---|---|---|---|---|---|---|
| Location | Auburn | Auburn | Auburn | Auburn | Auburn | Auburn |
| Breed of sire | Shorthorn | Angus | Angus | Hereford | Hereford | Shorthorn |
| Breed of dam | Hereford | H x S | S x H | A x S | S x A | A x H |
| Line or group[1] | C'breeding | C'breeding | C'breeding | C'breeding | C'breeding | C'breeding |
| Bulls: No. in group | | | | | | |
| Bulls: Feed regime[2] | | | | | | |
| Bulls: Av. init. age | | | | | | |
| Bulls: Av. init. wt. | | | | | | |
| Bulls: Av.no.da.fed | | | | | | |
| Bulls: Av. final wt. | | | | | | |
| Bulls: ADG on test | | | | | | |
| Bulls: Av. type sc. | | | | | | |
| Bulls: Av. cond. sc. | | | | | | |
| Bulls: Av. inbreeding | | | | | | |
| Heifers: No. in group | 4 | 2 | 2 | 1 | 1 | 1 |
| Heifers: Feed regime[2] | | | | | | |
| Heifers: Av. init. age | 319 | 352 | 337 | 264 | 357 | 363 |
| Heifers: Av. init. wt. | 471 | 465 | 526 | 485 | 500 | 440 |
| Heifers: Av.no.da.fed | 130 | 130 | 130 | 130 | 130 | 130 |
| Heifers: Av. final wt. | 741 | 715 | 775 | 740 | 782 | 675 |
| Heifers: ADG on test | 2.08 | 1.92 | 1.92 | 1.96 | 2.17 | 1.81 |
| Heifers: Av. type sc. | 12.0 | 12.5 | 11.5 | 14.0 | 13.0 | 12.0 |
| Heifers: Av. cond. sc. | | | | | | |
| Heifers: Av. inbreeding | 0 | 0 | 0 | 0 | 0 | 0 |
| Steers: No. in group | 4 | 2 | 3 | 2 | 3 | 1 |
| Steers: Feed regime[2] | | | | | | |
| Steers: Av. init. age | 428 | 411 | 434 | 448 | 450 | 437 |
| Steers: Av. init. wt. | 562 | 492 | 556 | 557 | 559 | 582 |
| Steers: Av.no.da.fed | 200 | 275 | 187 | 169 | 163 | 209 |
| Steers: Av. final wt. | 985 | 975 | 982 | 1010 | 989 | 1005 |
| Steers: ADG on test | 2.12 | 1.77 | 2.28 | 2.62 | 2.67 | 2.02 |
| Steers: Av. type sc. | | | | | | |
| Steers: Av. cond. sc. | 12.5 | 13.5 | 11.7 | 13.5 | 12.3 | 13.0 |
| Steers: Av. inbreeding | 0 | 0 | 0 | 0 | 0 | 0 |

1 - Show whether station or cooperator-owned, in addition to other group designation.

2 - Feed regime

| | Bulls | | Heifers | | Steers | |
|---|---|---|---|---|---|---|
| How fed - full, limited, etc. | | | | | | |
| Pounds/day over feeding period | | | | | | |
| Ration: | Gr. sn. corn | 58.0* | Gr. sn. corn | 31.5* | Gr. sn. corn | 58.0* |
| | Molasses | 6.0 | Molasses | 7.0 | Molasses | 6.0 |
| | CSM | 9.5 | CSM | 10.0 | CSM | 9.5 |
| *All ration ingrediants are expressed as percents. | Alfalfa meal | 3.0 | Alfalfa meal | 5.0 | Alfalfa meal | 3.0 |
| | CS hulls | 12.5 | CS hulls | 30.0 | CS hulls | 12.5 |
| | J'songrass hay | 9.5 | J'songrass hay | 15.0 | J'songrass hay | 9.5 |
| | Salt | 1.0 | Salt | 1.0 | Salt | 1.0 |
| | CDP | 0.5 | CDP | 0.5 | CDP | 0.5 |

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Alabama State

| | | | | | | |
|---|---|---|---|---|---|---|
| Location | Auburn | Blackbelt | Blackbelt | Blackbelt | Blackbelt | |
| Breed of sire | Shorthorn | Hereford | Hereford | Angus | Hereford | |
| Breed of dam | H x A | Hereford | A x H | A x H | 3/4H-1/4Br. | |
| Line or group[1] | C'breeding | C'breeding | C'breeding | C'breeding | C'breeding | |
| Bulls: No. in group | | | | | | |
| Bulls: Feed regime[2] | | | | | | |
| Bulls: Av. init. age | | | | | | |
| Bulls: Av. init. wt. | | | | | | |
| Bulls: Av.no.da.fed | | | | | | |
| Bulls: Av. final wt. | | | | | | |
| Bulls: ADG on test | | | | | | |
| Bulls: Av. type sc. | | | | | | |
| Bulls: Av. cond. sc. | | | | | | |
| Bulls: Av. inbreeding | | | | | | |
| Heifers: No. in group | 3 | | | | | |
| Heifers: Feed regime[2] | | | | | | |
| Heifers: Av. init. age | 353 | | | | | |
| Heifers: Av. init. wt. | 443 | | | | | |
| Heifers: Av.no.da.fed | 130 | | | | | |
| Heifers: Av. final wt. | 691 | | | | | |
| Heifers: ADG on test | 1.91 | | | | | |
| Heifers: Av. type sc. | 12.3 | | | | | |
| Heifers: Av. cond. sc. | | | | | | |
| Heifers: Av. inbreeding | 0 | | | | | |
| Steers: No. in group | 1 | 8 | 3 | 6 | 10 | |
| Steers: Feed regime[2] | | | | | | |
| Steers: Av. init. age | 451 | 355 | 307 | 376 | 366 | |
| Steers: Av. init. wt. | 575 | 639 | 635 | 672 | 698 | |
| Steers: Av.no.da.fed | 188 | 147 | 147 | 147 | 147 | |
| Steers: Av. final wt. | 985 | 939 | 985 | 971 | 993 | |
| Steers: ADG on test | 2.18 | 2.04 | 2.39 | 2.03 | 2.01 | |
| Steers: Av. type sc. | | 12.4 | 11.0 | 10.8 | 10.8 | |
| Steers: Av. cond. sc. | 15.0 | 10.9 | 11.7 | 11.0 | 10.1 | |
| Steers: Av. inbreeding | 0 | 0 | 0 | 0 | 0 | |

1 - Show whether station or cooperator owned, in addition to other group designation.

| 2 - Feed regime | Bulls | Heifers | Steers | |
|---|---|---|---|---|
| How fed - full, limited, etc. | | | Full | |
| Pounds/day over feeding period | | | | |
| Ration: All ration ingrediants are expressed as percents. | | | Gr. sn. corn | 56.0 |
| | | | Molasses | 10.0 |
| | | | CSM | 7.5 |
| | | | Urea | 1.5 |
| | | | CS hulls | 23.0 |
| | | | Salt | 1.0 |
| | | | CDP | 1.0 |

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Alabama State

| | | | | | | |
|---|---|---|---|---|---|---|
| Location | Winfield | Winfield | Winfield | Winfield | | |
| Breed of sire | Angus | Angus | Hereford | Hereford | | |
| Breed of dam | Mixed | Mixed | Mixed | Mixed | | |
| Line or group[1] | High | Low | High | Low | | |
| Bulls: No. in group | | | | | | |
| Bulls: Feed regime[2] | | | | | | |
| Bulls: Av. init. age | | | | | | |
| Bulls: Av. init. wt. | | | | | | |
| Bulls: Av.no.da.fed | | | | | | |
| Bulls: Av. final wt. | | | | | | |
| Bulls: ADG on test | | | | | | |
| Bulls: Av. type sc. | | | | | | |
| Bulls: Av. cond. sc. | | | | | | |
| Bulls: Av. inbreeding | | | | | | |
| Heifers: No. in group | 13 | 8 | 12 | 7 | | |
| Heifers: Feed regime[2] | | | | | | |
| Heifers: Av. init. age | 370 | 375 | 377 | 376 | | |
| Heifers: Av. init. wt. | 510 | 476 | 550 | 504 | | |
| Heifers: Av.no.da.fed | 167 | 167 | 167 | | | |
| Heifers: Av. final wt. | 778 | 637 | 727 | 740 | | |
| Heifers: ADG on test | 1.60 | 1.57 | 1.66 | 1.46 | | |
| Heifers: Av. type sc. | 10.3 | 11.1 | 11.0 | 9.9 | | |
| Heifers: Av. cond. sc. | 11.6 | 11.9 | 11.0 | 10.4 | | |
| Heifers: Av. inbreeding | 0 | 0 | 0 | 0 | | |
| Steers: No. in group | 8 | 9 | 6 | 9 | | |
| Steers: Feed regime[2] | | | | | | |
| Steers: Av. init. age | 369 | 347 | 367 | 358 | | |
| Steers: Av. init. wt. | 573 | 520 | 570 | 513 | | |
| Steers: Av.no.da.fed | 167 | 167 | 167 | 167 | | |
| Steers: Av. final wt. | 804 | 802 | 863 | 775 | | |
| Steers: ADG on test | 1.39 | 1.69 | 1.75 | 1.57 | | |
| Steers: Av. type sc. | 9.9 | 10.6 | 10.6 | 8.3 | | |
| Steers: Av. cond. sc. | 11.5 | 12.0 | 11.5 | 10.3 | | |
| Steers: Av. inbreeding | 0 | 0 | 0 | 0 | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

| 2 - Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | | Full | Full |
| Pounds/day over feeding period | | | |
| Ration<br><br>All ration ingrediants are expressed as percents. | | Corn 59.0<br>CSM 5.0<br>Molasses 10.0<br>Alfalfa hay 25.0<br>Salt 1.0 | Corn 59.0<br>CSM 5.0<br>Molasses 10.0<br>Alfalfa hay 25.0<br>Salt 1.0 |

FORM III
SLAUGHTER DATA, 1963

Alabama State

| Location | Auburn | Auburn | Auburn | Auburn | Auburn | Auburn |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Hereford | Shorthorn | Angus | Angus | Hereford |
| Breed of dam | Angus | Hereford | Shorthorn | Hereford | Shorthorn | Angus |
| Line or group | Cross-breeding | Cross-breeding | Cross-breeding | Cross-breeding | Cross-Breeding | Cross-breeding |
| Sex | Steers | Steers | Steers | Steers | Steers | Steers |
| Age at slaughter | 548 | 547 | 562 | 667 | 590 | 599 |
| No. slaughtered | 3 | 5 | 4 | 1 | 1 | 4 |
| Days in feedlot | 214 | 214 | 214 | 237 | 214 | 214 |
| Final feedlot wt. | 923 | 891 | 894 | 970 | 1080 | 1000 |
| Live sl. wt. | | | | | | |
| Cold carcass wt. | 573 | 526 | 541 | 595 | 674 | 616 |
| Cold dressing percent | 62.1 | 59.0 | 60.5 | 61.3 | 62.4 | 61.6 |
| Carcass grade, quality | 15.3 | 11.2 | 12.0 | 14.0 | 13.0 | 13.0 |
| Carcass grade, cutability | | | | | | |
| Est. percent, kidney fat | | | | | | |
| Rib-eye area/100 lbs.carc.(sq.in.) | 2.03 | 2.04 | 1.96 | 2.10 | 1.60 | 2.07 |
| Marbling sc., USDA | | | | | | |
| Fat thickness over ribeye(in.)[1] | 0.55 | 0.39 | 0.48 | 0.50 | 0.60 | 0.70 |
| W-B shear force, lbs.[2] | 14.3 | 15.4 | 17.5 | 16.0 | 19.0 | 17.0 |

1 - Use one measure; in not, indicate method.

2 - Indicate size of core used and how meat was cooked.

1-inch core, 7th rib
155° F. internal temperature

FORM III
SLAUGHTER DATA, 1963

Alabama State

| Location | Auburn | Auburn | Auburn | Auburn | Auburn | Auburn |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Shorthorn | Shorthorn | Angus | Angus | Hereford |
| Breed of dam | Shorthorn | Angus | Hereford | H x S | S x H | A x S |
| Line or group | Cross-breeding | Cross-breeding | Cross-breeding | Cross-breeding | Cross-breeding | Cross-breeding |
| Sex | Steers | Steers | Steers | Steers | Steers | Steers |
| Age at slaughter | 595 | 585 | 628 | 686 | 621 | 617 |
| No. slaughtered | 5 | 5 | 4 | 2 | 3 | 2 |
| Days in feedlot | 204 | 214 | 200 | 275 | 187 | 169 |
| Final feedlot wt. | 986 | 962 | 985 | 975 | 982 | 1010 |
| Slaughter wt. | | | | | | |
| Carcass wt. cold | 605 | 592 | 606 | 595 | 610 | 634 |
| Dressing percent, cold | 61.4 | 61.5 | 61.5 | 61.0 | 62.1 | 62.8 |
| Carcass grade, quality | 12.6 | 14.6 | 12.5 | 13.5 | 11.7 | 13.5 |
| Carcass grade, cutability | | | | | | |
| Est. percent, kidney fat | | | | | | |
| Rib-eye area/100 lbs.carc.,sq.in. | 1.80 | 1.89 | 1.68 | 1.92 | 1.77 | 1.70 |
| Marbling score, USDA | | | | | | |
| Fat thickness over ribeye,in.[1] | 0.63 | 0.63 | 0.56 | 0.60 | 0.50 | 0.50 |
| W-B shear forcs, lbs.[2] | 17.6 | 12.4 | 14.5 | 15.3 | 15.9 | 16.2 |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

1" core, 7th rib, 155° F. internal temperature

FORM III
SLAUGHTER DATA, 1963

Alabama State

| Location | Auburn | Auburn | Auburn | Blackbelt | Blackbelt | Blackbelt |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Shorthorn | Shorthorn | Hereford | Hereford | Angus |
| Breed of dam | S x A | A x H | H x A | Hereford | A x H | A x H |
| Line or group | Cross-breeding | Cross-breeding | Cross-breeding | | | |
| Sex | Steers | Steers | Steers | Steers | Steers | Steers |
| Age at slaughter | 613 | 646 | 639 | 502 | 454 | 523 |
| No. slaughtered | 3 | 1 | 1 | 8 | 3 | 6 |
| Days in feedlot | 163 | 209 | 188 | 147 | 147 | 147 |
| Final feedlot weight | 989 | 1005 | 985 | 939 | 985 | 971 |
| Slaughter wt., live | | | | | | |
| Carcass wt., cold | 620 | 633 | 607 | 555 | 572 | 596 |
| Dressing percent, cold | 62.7 | 63.0 | 61.6 | 59.1 | 58.1 | 61.4 |
| Carcass grade, quality | 12.3 | 13.0 | 15.0 | 10.9 | 11.7 | 10.8 |
| Carcass grade, cutability | | | | | | |
| Est. percent, kidney fat | | | | | | |
| Rib-eye area/100 lbs.carc.,sq.in. | 2.01 | 1.53 | 1.69 | 1.77 | 1.97 | 1.78 |
| Marbling score, USDA | | | | 5.0 | 6.3 | 5.8 |
| Fat thickness over ribeye, in.[1] | 0.62 | 0.60 | 0.60 | 0.63 | 0.72 | 0.47 |
| W-B shear force, lbs.[2] | 16.4 | 15.4 | 13.2 | | | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

(Auburn) - 1" core, 7th rib, 155° F. internal temperature.

FORM III
SLAUGHTER DATA, 1963

Alabama State

| Location | Blackbelt | Winfield | Winfield | Winfield | Winfield | Winfield |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Angus | Angus | Angus | Angus | Hereford |
| Breed of dam | 1/4B-3/4H | Mixed | Mixed | Mixed | Mixed | Mixed |
| Line or group | | High | Low | High | Low | High |
| Sex | Steers | Steers | Steers | Heifers | Heifers | Steers |
| Age at slaughter | 513 | 536 | 541 | 537 | 542 | 534 |
| No. slaughtered | 10 | 8 | 9 | 13 | 8 | 6 |
| Days in feedlot | 147 | 167 | 167 | 167 | 167 | 167 |
| Final feed-lot weight | 993 | 804 | 802 | 778 | 739 | 863 |
| Slaughter wt., live | | | | | | |
| Carcass wt., cold | 599 | 481 | 498 | 476 | 454 | 530 |
| Dressing per-cent, cold | 60.3 | 59.8 | 62.1 | 61.2 | 61.4 | 61.4 |
| Carcass grade, quality | 10.1 | 11.5 | 12.0 | 11.6 | 11.9 | 11.5 |
| Carcass grade, cutability | | | | | | |
| Est. percent kidney fat | | | | | | |
| Rib-eye area/100 lbs.carc.,sq.in. | 1.80 | | | | | |
| Marbling score, USDA | 5.0 | | | | | |
| Fat thickness over ribeye, in.[1] | 0.65 | | | | | |
| W-B shear force, lbs.[2] | | | | | | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

FORM III
SLAUGHTER DATA, 1963

Alabama State

| Location | Winfield | Winfield | Winfield | | | |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | Hereford | | | |
| Breed of dam | Mixed | Mixed | Mixed | | | |
| Line or group | Low | High | Low | | | |
| Sex | Steers | Heifers | Heifers | | | |
| Age at slaughter | 525 | 544 | 543 | | | |
| No. slaughtered | 9 | 12 | 7 | | | |
| Days in feedlot | 167 | 167 | 167 | | | |
| Final feedlot weight | 775 | 827 | 748 | | | |
| Slaughter wt., live | | | | | | |
| Carcass wt., cold | 469 | 511 | 454 | | | |
| Dressing percent, cold | 60.5 | 61.8 | 60.7 | | | |
| Carcass grade, quality | 10.3 | 11.0 | 10.4 | | | |
| Carcass grade, cutability | | | | | | |
| Est. percent, kidney fat | | | | | | |
| Rib-eye area/100 lbs. carc., sq. in. | | | | | | |
| Marbling score, USDA | | | | | | |
| Fat thickness over ribeye, in.[1] | | | | | | |
| W-B shear force, lbs.[2] | | | | | | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

UNIVERSITY OF ARKANSAS
Agricultural Experiment Station

I. PROJECT: Hatch 170, AHRD Line Project d1-8 (S-10)

Evaluation of Performance Records of Beef Cattle

II. OBJECTIVES:

To continue to develop practical but adequate methods for identifying, evaluating, and propagating the genetic potential for the production of beef. This would involve determining the kind and number of performance records necessary to prove beef sires and dams, as well as the proper use of records in planning matings.

III. PERSONNEL:

C. J. Brown, Warren Gifford, R. S. Honea, J. E. Gage, N. G. Covington, H. Williams, H. P. Peterson, and M. C. Heck

IV. ACCOMPLISHMENTS DURING THE YEAR:

This project was continued with the same basic data being accumulated as in previous years. These data record the fertility, growth, and lifetime development patterns of the several groups of cattle which are maintained at the Arkansas station. All cattle were classified for type, with details of nine items of conformation and quality recorded. Monthly weights were taken on 660 cattle under two years of age, and body measurements were taken at 4, 8, 12, 16, 20, and 24 months. Weights and measurements of 374 mature cattle were taken in January and July. Ninety-seven station owned bulls were individually fed. On these, 45 were slaughtered to obtain carcass data and evaluation of eating quality. In a companion state project, 142 bulls were individually fed for cooperating breeders in the state. Heifers were group fed on pasture during the post-weaning period.

Due to a reorganization of work at the Livestock and Forestry Branch Station, Batesville, a shift of the cattle assigned to this project was made. The herd which has been maintained at this station was divided, with 63 cows, 11 heifers, and 4 bulls being transferred to the Main Experiment Station, Fayetteville. This will allow more critical comparison of the two groups of Angus cattle maintained at this station. In previous years, these comparisons have been confounded with differences in location of the two cow herds. The remainder of the herd that had been maintained at the Livestock and Forestry Branch Station was transferred to the Pine Tree land use area near Forest City. In addition to the cattle mentioned, 25 Shorthorn cows and 37 Angus cows from the Main Station herds were transferred to the Pine Tree area, along with cattle from two other branch stations. The

herd assembled at the Pine Tree area now numbers about 300 cows. It is anticipated that this area will support about 1000 cows (500 Hereford and 500 Angus) and will be developed to this size from the growth of the present cattle assigned there. The calves produced in this herd will be fed to market weights, slaughtered at a grade of low choice, and carcass data will be obtained. The bulls used in these herds will be performance tested, and records obtained will provide progeny tests for weaning and carcass characteristics. This will provide an opportunity to further study the relationships between production traits of individual bulls and the production and carcass traits of their progeny. Eight bulls are presently being used in this herd.

During the year, the study on factors affecting size of three-year-old cows was finished and submitted for publication. The study comparing the performance test records of sires and their sons was also completed and submitted for publication. Tables 1 and 2 which accompany this report give the heritability estimates obtained in these studies.

TABLE 1. Means, Standard Deviations, and Heritability Estimates of Weight and Body Dimensions of 3-Year-Old Beef Cows

| Trait | Means | | Std. deviations | | Heritability estimates |
|---|---|---|---|---|---|
| | Dams | Daughters | Dams | Daughters | |
| Weight, lb. | 898 | 900 | 85 | 78 | 0.44 ± .15 |
| Wither height, in. | 46.8 | 45.8 | 1.0 | 1.1 | 0.41 ± .18 |
| Hip height, in. | 47.5 | 46.9 | 1.1 | 1.1 | 0.69 ± .18 |
| Shoulder width, in. | 16.1 | 16.4 | 1.0 | 0.9 | 0.40 ± .05 |
| Hip width, in. | 17.4 | 17.8 | 1.1 | 0.8 | 0.11 ± .12 |
| Chest depth, in. | 25.3 | 24.8 | 0.6 | 0.8 | 0.71 ± .22 |
| Rt. flank depth, in. | 21.7 | 21.1 | 1.0 | 1.0 | 0.39 ± .17 |
| Heart girth, in. | 69.3 | 69.2 | 2.3 | 2.5 | 0.46 ± .18 |
| Body length, in. | 58.9 | 58.8 | 1.8 | 2.2 | 0.48 ± .21 |

TABLE 2. Heritability Estimates and Standard Errors Based on Sire-Son Regression Coefficients Estimated by Three Different Methods

| Performance trait | Method 1[a] | 2[b] | 3[c] |
|---|---|---|---|
| 120-day weight | 0.18 ± 0.25 | 0.28 ± 0.18 | 0.19 ± 0.19 |
| Initial test weight | 0.15 ± 0.18 | 0.27 ± 0.09** | 0.27 ± 0.13* |
| Average daily gain | 0.80 ± 0.18** | 0.96 ± 0.13** | 0.93 ± 0.18** |
| Feed consumption | 0.43 ± 0.21 | 0.43 ± 0.10* | 0.43 ± 0.18** |
| Feed conversion[d] | 0.35 ± 0.27 | 0.42 ± 0.13** | 0.41 ± 0.25 |
| Final test weight | 0.19 ± 0.14 | 0.40 ± 0.10** | 0.37 ± 0.14** |
| Type score | 0.11 ± 0.22 | 0.21 ± 0.12 | 0.15 ± 0.15 |
| Production index | 0.77 ± 0.29* | 0.80 ± 0.18** | 0.79 ± 0.18** |

[a]Regression of progeny average on sire's record.
[b]Sire's record repeated for each progeny record.
[c]Kempthorne-Tandon weighted regression technique.
[d]Adjusted for differences in initial weight.

* $P < 0.05$
** $P < 0.01$

With the aid of the regional coordinator, somascope readings were obtained on 92 bulls that had completed performance test. Of these bulls, 45 were slaughtered and comparisons were made with the ultrasonic estimates of rib-eye area and fat thickness. The results of these comparisons are being summarized and prepared for publication.

## V. FUTURE PLANS:

Basic data collection will be continued according to the project outline. The relationship of performance to sexual development is being studied in bulls. The relationship of performance to agonistic behavior is also being studied. The comparison of ultrasonic measurements and carcass measurements will be published.

## VI. PUBLICATIONS DURING THE YEAR:

Brown, C. J., P. K. Lewis, Jr., and M. C. Heck. 1963. The relationship between performance test information and carcass cut-out data and eating quality of steaks from beef bulls. Arkansas Agr. Expt. Sta., Bulletin 676.

VII. PUBLICATIONS PLANNED:

Brown, C. J. and Maximo Gacula, Jr. 1964. Estimates of heritability of beef cattle performance traits by regression of offspring on sire. Submitted to Journal of Animal Science.

Brown, C. J. and Larry Franks. 1964. Factors affecting size of young beef cows. Submitted to Journal of Animal Science.

Submitted by: C. J. Brown

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Arkansas State

| Location | Main Sta. | Main Sta. | Main Sta. | Main Sta. | Batesville | Batesville |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | Angus | Angus | Angus | Angus |
| Breed of dam | Hereford | Hereford | Angus | Angus | Angus | Angus |
| Line or group[1] | (spring) Purebred | (fall) Purebred | (spring) Purebred | (fall) Purebred | (spring) Purebred | (fall) Purebred |
| No. cows exposed[2] | 65 | 59 | 66 | 55 | 45 | 51 |
| No. calves born[3] | 62 | 56 | 62 | 55 | 33 | 45 |
| Calving percent, born | 95 | 95 | 94 | 100 | 73 | 88 |
| Av. birth date | 10-14-62 | 3-24-63 | 10-17-62 | 3-22-63 | 10-02-62 | 2-28-63 |
| Av. birth wt. | 67 | 66 | 61 | 63 | 57 | 59 |
| No. calves weaned | 52 | 53 | 59 | 50 | 28 | 39 |
| Calving percent, weaned[4] | 80 | 90 | 89 | 91 | 62 | 76 |
| Av. weaning age, days | 210 | 208 | 209 | 212 | 211 | 246 |
| Adj. ADG[5] | 1.31 | 1.72 | 1.36 | 1.74 | 1.67 | 1.59 |
| Av. type sc.[6] | 11 | 12 | 12 | 12 | | 13 |
| Av. cond. sc.[6] | | 11 | | 11 | | 12 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

$$\text{Average Daily Gain} = \frac{\text{weight - birth weight}}{\text{age in days}}$$

Weight was adjusted for sex and age of dam

6 - 15-17 = Fancy
12-14 = Choice
9-10 = Good
6-8 = Medium

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Arkansas State

| | Location | Main Sta. | Main Sta. | Main Sta. | Main Sta. | Main Sta. |
|---|---|---|---|---|---|---|
| | Breed of sire | Hereford | Angus | Shorthorn | Hereford | Angus |
| | Breed of dam | Hereford | Angus | Shorthorn | Hereford | Angus |
| | Line or group[1] | P'bred (s) | P'bred (s) | P'bred (s) | P'bred (f) | P'bred (f) |
| Bulls | No. in group | 22 | 24 | 3 | 14 | 34 |
| | Feed regime[2] | | | | | |
| | Av. init. age | 230 | 242 | 223 | 223 | 227 |
| | Av. init. wt. | 423 | 466 | 370 | 398 | 434 |
| | Av.no.da.fed | 154 | 154 | 154 | 154 | 154 |
| | Av. final wt. | 766 | 784 | 671 | 744 | 724 |
| | ADG on test | 2.23 | 2.07 | 1.95 | 2.25 | 1.87 |
| | Av. type sc. | 11 | 11 | 10 | 13 | 13 |
| | Av. cond. sc. | 12 | 12 | 11 | 12 | 12 |
| | Av. inbreeding | | | | | |
| Heifers | No. in group | 22 | 13 | | 15 | 15 |
| | Feed regime[2] | | | | | |
| | Av. init. age | 233 | 234 | | 214 | 221 |
| | Av. init. wt. | 417 | 444 | | 376 | 344 |
| | Av.no.da.fed | 154 | 154 | | 154 | 154 |
| | Av. final wt. | 513 | 533 | | 488 | 456 |
| | ADG on test | 0.62 | 0.58 | | 0.73 | 0.73 |
| | Av. type sc. | 10 | 10 | | 10 | 11 |
| | Av. cond. sc. | 10 | 10 | | 10 | 10 |
| | Av. inbreeding | | | | | |
| Steers | No. in group | | | | | |
| | Feed regime[2] | | | | | |
| | Av. init. age | | | | | |
| | Av. init. wt. | | | | | |
| | Av.no.da.fed | | | | | |
| | Av. final wt. | | | | | |
| | ADG on test | | | | | |
| | Av. type sc. | | | | | |
| | Av. cond. sc. | | | | | |
| | Av. inbreeding | | | | | |

1 - Show whether station-owned or cooperator-owned, in addition to other group designation. Station owned; (s) = spring

| 2 - Feed regime | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | Full-fed hay, grain adj. daily to 2:1 | Group fed on pasture 3-4 lbs. grain/day | |
| Pounds/day over feeding period | | | |
| Ration: | 800 lbs. crimped corn<br>400 lbs. crimped oats<br>400 lbs. CSM<br>200 lbs. wheat bran<br>100 lbs. molasses<br>100 lbs. alfalfa<br>20 lbs. calcium carb. | | |

# FORM II
# POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Arkansas State

| | Location | Newport | Newport | Hope | Hope | Main Sta. | Main Sta. |
|---|---|---|---|---|---|---|---|
| | Breed of sire | Hereford | Angus | Hereford | Angus | Hereford | Angus |
| | Breed of dam | Hereford | Angus | Hereford | Angus | Hereford | Angus |
| | Line or group[1] | P'bred (s) | P'bred (s) | P'bred (s) | P'bred (s) | P'bred (s) | P'bred (s) |
| Bulls | No. in group | 11 | 31 | 33 | 3 | 37 | 20 |
| | Feed regime[2] | | | | | | |
| | Av. init. age | 304 | 288 | 279 | 316 | 279 | 299 |
| | Av. init. wt. | 625 | 564 | 543 | 674 | 577 | 635 |
| | Av.no.da.fed | 154 | 154 | 154 | 154 | 154 | 154 |
| | Av. final wt. | 1059 | 954 | 917 | 1014 | 1001 | 1018 |
| | ADG on test | 2.81 | 2.53 | 2.41 | 2.16 | 2.31 | 2.49 |
| | Av. type sc. | 12 | 13 | 12 | 12 | 13 | 13 |
| | Av. cond. sc. | 12 | 12 | 12 | 12 | 12 | 12 |
| | Av. inbreeding | | | | | | |
| Heifers | No. in group | | | | | | |
| | Feed regime[2] | | | | | | |
| | Av. init. age | | | | | | |
| | Av. init. wt. | | | | | | |
| | Av.no.da.fed | | | | | | |
| | Av. final wt. | | | | | | |
| | ADG or test | | | | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | | | | | | |
| | Av. inbreeding | | | | | | |
| Steers | No. in group | | | | | | |
| | Feed regime[2] | | | | | | |
| | Av. init. age | | | | | | |
| | Av. init. wt. | | | | | | |
| | Av.no.da.fed | | | | | | |
| | Av. final wt. | | | | | | |
| | ADG on test | | | | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | | | | | | |
| | Av. inbreeding | | | | | | |

1 - Show whether station-owned or cooperator-owned, in addition to other group designation. Cooperator owned; (s) = spring

| 2 - Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | | | |
| Pounds/day over feeding period | | | |
| Ration: | 700 lbs. cottonseed hulls<br>900 lbs. cracked corn<br>200 lbs. crimped oats<br>300 lbs. protein meal<br>1000 units vitamins/lb. of feed | | |

FORM III
SLAUGHTER DATA, 1963

Arkansas State

| Location | Main Sta. | Main Sta. | Main Sta. | Main Sta. | Main Sta. | |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Angus | Shorthorn | Hereford | Angus | |
| Breed of dam | Hereford | Angus | Shorthorn | Hereford | Angus | |
| Line or group | (spring) Purebred | (spring) Purebred | (spring) Purebred | (fall) Purebred | (fall) Purebred | |
| Sex | Male | Male | Male | Male | Male | |
| Age at slaughter | 409 | 416 | 396 | 423 | 399 | |
| No. slaughtered | 13 | 14 | 3 | 4 | 16 | |
| Days in feedlot | 154 | 154 | 154 | 154 | 154 | |
| Final feedlot wt. | 766 | 784 | 671 | 744 | 724 | |
| Slaughter wt., live | 797 | 780 | 724 | 792 | 707 | |
| Carcass wt., cold | 430 | 433 | 385 | 419 | 381 | |
| Dressing percent, cold | 54 | 55 | 53 | 53 | 54 | |
| Carcass grade, quality | 10 | 10 | 11 | 10 | 9 | |
| Carcass grade, cutability | | | | | | |
| Est. percent kidney fat | | | | | | |
| Rib-eye area/100 lbs. carc.(sq.in.) | 8.82 | 10.25 | 8.26 | 9.17 | 8.92 | |
| Marbling sc., USDA | 9 | 9 | 9 | 10 | 9 | |
| Fat thickness over ribeye (in.)[1] | 0.26 | 0.25 | 0.25 | 0.34 | 0.24 | |
| W-B shear force, lbs.[2] | | | | | | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

UNIVERSITY OF FLORIDA
Agricultural Experiment Station

I. PROJECT: Hatch 1136, AHRD Line Project dl-34 (S-10)

Biochemical and Cytological Investigations of Inherited Dwarfism in Beef Cattle

II. OBJECTIVES:

To determine biochemical abnormalities in body fluids and tissues which may serve to identify carriers of the dwarfism trait.

To determine the cytogenic characteristics of dwarf, carrier, and non-carrier cattle.

III. PERSONNEL:

J. R. Crockett, Marvin Koger, and J. P. Feaster

IV. ACCOMPLISHMENTS DURING THE YEAR:

During the past year an area for metabolism stalls and a small slaughter area for studying radioactive animals was provided. This facility will be used in conjunction with the isotope work on mucopolysaccharides and other compounds. In order to study the first objective, research is proceeding through the embryo development of the bovine. Dwarf x dwarf, dwarf x carrier, dwarf x normal, and normal x normal matings have been made. Embryos have been removed at 40, 60, and 90 days of age and the cows returned to the breeding herd to be bred again. This is an attempt to bracket the stage of development at which the dwarf gene action is apparent. When this stage of development is bracketed, biochemical analyses will be made to determine the biochemical differences between the three genotypes of dwarf, carrier, and normal. At present, 18 embryos of varying ages have been recovered and are being studied.

Techniques are still being perfected for the culture of bovine leucocytes for cytogenic studies. Adequate facilities are still not available for this part of the project. Cell culture studies are being initiated using embryonic tissue. At present, no research results are available.

V. FUTURE PLANS:

Continued investigations into the embryonic development of abnormal developing bovines are planned. Cell culture studies from embryonic tissue will also be continued.

VI. PUBLICATIONS DURING THE YEAR:

None

VII. PUBLICATIONS PLANNED:

Project 1136 is a new revision of Project 752. Two abstracts from Project 752 have been submitted to the American Society of Animal Science for presentation at the annual meeting, August 1964, and for publication in the Journal of Animal Science.

Submitted by: J. R. Crockett

WEST CENTRAL FLORIDA EXPERIMENT STATION
Brooksville, Florida

I. PROJECT: State 629, AHRD Line Project d1-5 (S-10)

Selection of Cattle for Beef Production in the Southeastern United States

II. OBJECTIVES:

To improve the reproductive efficiency and meat producing qualities of different strains of cattle under Florida conditions.

To test various breeding systems with these cattle.

To determine if "combining ability" can be increased with cross-progeny testing.

III. PERSONNEL:

Marvin Koger, W. C. Burns, R. S. Temple, A. C. Warnick, A. Z. Palmer, J. R. Crockett, and H. L. Chapman

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of the work.

A three-bedroom house was completed at the Turnley area. Improvement of other facilities included the installation of a scale at the molasses area, the installation of a scale and a new squeeze chute at the Turnley area, the addition of asbestos siding on the high gabled ends of the barn and on all of the old dairy and milk barn, and continued maintenance of all fences. The citrus grove was cleared, fenced, and planted in permanent pasture.

2. Research results.

Preliminary studies on blood and liver biopsy showed there was no deficiency of copper and Vitamin A on cattle tested.

Cattle on winter molasses weaned calves which averaged 437 lbs., while cattle on molasses the year around weaned calves averaging 435 lbs.

The Santa Gertrudis cattle continued to wean the heaviest calves, 515 lbs.; followed by Line 4 Herefords, 443 lbs.; Angus and cross-bred calves, 433 lbs.; and Brahman, 418 lbs.

Calving percent ranged from a high of 93 for the $F_1$ Brahman x Angus to 85 for the Line 4 Herefords, 81 for the Brahman, 76 for the Angus, and a low of 50 for the Santa Gertrudis.

The Brahman x Angus cattle also had the highest weaning percentage, 87; with the other breeds ranked as follows: Brahman, 77; Line 4 Herefords, 74; Angus, 72; and Santa Gertrudis, 45.

A sire interaction showed up in the "combining ability" study, as one Angus bull sired much better Angus calves than crossbred calves and another Angus bull sired much better crossbred calves than Angus calves. The other four Angus bulls sired both Angus and crossbred calves of comparable value. Sons of the two interaction bulls were kept for breeding to see if this trait is transmitted to the sires' offspring and if selection can be made. This study involved six Angus bulls, with each bull being bred to 15 head of purebred Angus cows and 15 head of $F_1$ Brahman x Angus cows, for a total of 90 head of Angus and 90 head of crossbred cattle. Complete feedlot and carcass information was obtained on all the steer and heifer calves from the crossbred group.

## V. FUTURE PLANS:

### 1. Method of procedure for new project.

Brahman and Santa Gertrudis breeding herds will be divided into two groups on the basis of age, pregnancy, and production record. Group 1 will be bred during a three-month season from March 14 to June 15, while Group 2 will be bred continuously on a year-round basis beginning March 15. Once a female is assigned to a group, she will remain there as long as she remains in the breeding herd. Culling of the cow herd will be kept to a minimum, with the exception of cows having extended sterility of two years. Culled sterile cows will be slaughtered and the reproductive and endocrine tissues studied to determine causes of infertility. Any sick or injured cows will be culled from the group, and replacement females will come from within the respective groups. Two bulls within each breed will be used each year, with one-half of the females of each group bred to each bull to minimize differences in bull fertility. The following table shows the design and number of females during the initial year. Subsequent years will be similar, with numbers increasing annually.

TABLE 1. Initial Breeding Plan

| Breed | | Seasonally Bred Group 1 | | | Continuous Breeding Group 2 | | |
|---|---|---|---|---|---|---|---|
| Brahman | Bull | A | B | Total | A | B | Total |
| | No. female | 10 | 10 | 20 | 10 | 10 | 20 |
| S. Gert. | Bull | A | B | Total | A | B | Total |
| | No. female | 12 | 11 | 23 | 12 | 12 | 24 |

Cows from Group 1 and 2 will be in the same pasture with their respective bulls during the first three months - March 15 to June 15 - of the breeding season; after which, the Group 1 cows will be removed to separate

but comparable pastures. Cows will be provided with adequate feed supplement during the winter, depending upon pasture quality and quantity. Bulls will be tested for semen quality, and only fertile bulls will be used.

The measurement criteria used will be: (1) pregnancy percent, calving percent, and weaning percent; (2) season of calving; (3) weaning weight and grade; (4) weight of the cow at the four seasons of the year; and (5) calf production - weaning weight and numbers of calves - per cow and per hundredweight of the cow. Blood samples will be taken from cows at different seasons to determine estrogen levels and relate to ovarian changes.

Calves born to Group 1 cows and to Group 2 cows during the first three months of the calving season will be weaned during the last week in August, at the regular weaning time. The other calves from Group 2 will be weaned when they are approximately 205 days of age. Weaning weight and grade will be determined at this time. After weaning, the bull and heifer calves will be separated and raised on pasture with adequate supplemental feed for a normal growth rate. Replacement heifers from the respective groups will be added to the breeding herd at approximately 26 months of age.

All heifers will be palpated at monthly intervals, beginning at one year of age, to determine earliness of a corpus luteum and regularity of ovulation. Also, non-pregnant cows will be palpated at monthly intervals to detect time of ovulation after parturition and subsequent ovulation at other seasons of the year. These data will give a possible explanation for failure of pregnancy.

The data will be analyzed by analysis of variance technique to obtain the main effects of groups (length of season), breed, and year and their interactions.

2. Other plans.

There will be continuous expansion of cattle numbers to meet the requirements of the project outline.

The effect of injectible Vitamin A on the performance of beef cattle will be evaluated.

This project will be closed out and three articles pertaining to it will be published. However, the Angus and crossbred cattle will continue to be used in the "combining ability" study and the Herefords will continue to be used in the genetic-environmental interaction study. The Brahman and Santa Gertrudis herds will be utilized in the new project entitled "Seasonal vs. Continual Breeding in Beef Cattle", as indicated above.

## VI. PUBLICATIONS DURING THE YEAR:

None

VII. PUBLICATIONS PLANNED:

Comparative performance of British, Brahman, and crossbred foundation cattle.

Factors influencing pregnancy rate of beef cows at the West Central Florida Experiment Station.

Creep feeding beef calves in Florida.

Submitted by: W. C. Burns

I. PROJECT: State 1186, AHRD Line Project d1-41 (S-10)

A Study of Response to Selection and Genetic-Environmental Interaction in Genetically Similar Groups of Hereford Cattle at Two Locations

II. OBJECTIVES:

To determine whether originally genetically similar groups of cattle bred and selected for several generations according to the same criteria in the two markedly different environmental conditions of Miles City, Montana, and Brooksville, Florida, become genetically different or remain similar.

To estimate the importance of genetic-environmental interaction within a British breed of beef cattle.

To determine the importance of adaptation to a specific location if maximum productivity is to be attained.

III. PERSONNEL:

E. J. Warwick, O. F. Pahnish, W. C. Burns, J. S. Brinks, R. S. Temple, Marvin Koger, and F. S. Willson

IV. ACCOMPLISHMENTS DURING THE YEAR:

A long-time cooperative project between the Florida Agricultural Experiment Station, the U. S. Department of Agriculture, and the Montana Agricultural Experiment Station, has been set up to get information on the basic question of whether selection in beef cattle will be most effective in herds maintained under conditions typical of the area in which they are raised or if it will be equally effective when carried on at some other climatically different location. The basic experimental design involved the division of existing herds of cattle at Miles City and Brooksville into equivalent groups with a random half of the cattle from each location being transferred to the other.

The first shipment of Hereford cattle from Miles City to Brooksville, in November 1961, consisted of 25 weaning heifer calves, 18 yearling heifers, and 19 pregnant cows three years old or older. Two more shipments of cattle from Miles City were made in November 1962 and 1963, for a total transfer of 90 females and 4 bulls. In November 1962, one-half of the Brooksville Herefords were shipped to Miles City. Except for bulls, no other transfer of cattle will be made.

Reproduction is one of the best measurements of cattle performance because it is an all or none process. A respectable reproduction rate results in easier selection for all other characteristics that are necessary to make a profitable beef animal. The following table gives the reproductive performance for the Miles City and Brooksville heifers for 1962 and 1963. This is the percentage of cattle pregnant in August as determined by pregnancy diagnosis.

TABLE 1. Reproductive Performance, 1962-1963

| | Miles City | | | Brooksville | | |
|---|---|---|---|---|---|---|
| | 1962 | 1963 | Total | 1962 | 1963 | Total |
| Number bred | 37 | 59 | 96 | 27 | 28 | 55 |
| Number pregnant | 31 | 50 | 82 | 23 | 26 | 49 |
| Percent | 84 | 85 | 85 | 85 | 93 | 89 |

Initial pregnancy rate, in itself, is not of too much importance; the important thing is the number or percentage of calves weaned. This figure is much too low, as shown in the following table.

TABLE 2. Weaning Performance of Miles City and Brooksville Herefords for 2 Years

| | Miles City | Brooksville |
|---|---|---|
| Weaning percent | 75.11[a] | 73.75[a] |
| Death loss percent | 16.00[b] | 7.81[b] |
| Number of calves weaned | 42 | 59 |
| Age (days) | 226 | 221 |
| Slaughter grade | 8.75[c] | 10.47[c] |
| Feeder grade | 10.76[c] | 12.15[c] |
| Weaning weight | 390 | 441 |
| 205-day weight | 358 | 414 |
| Adjusted daily gain | 1.64 | 1.81 |

[a]percentage of the cows bred.
[b]percentage of the calves born.
[c]6-8 = Standard
9-11 = Good
12-14 = Choice

Death loss in both groups - and especially in the Miles City group - is excessive and very difficult to explain. One-half of the Miles City calves died in delivery or were dead at birth and all of the calves in the Brooksville group died this way. They were normal in every respect and it was obvious that they had been carried the proper length of time; yet they did not survive.

Weaning weights for both groups are respectable, especially in consideration of the adjustment the Miles City cattle had to make to Florida conditions. Differences in performance of the Miles City and Brooksville bulls on a 140-day feeding test were small. The Brooksville bulls gained slightly more but were less efficient. They were heavier when they went on feed.

The Miles City heifer calves gained just as well and in some cases slightly more than the Brooksville calves during the year following weaning. Average 18-month weight was 643 lbs. for the Miles City heifers and 655 lbs. for the Brooksville heifers. Average weight of five-year-olds

was 1168 lbs. for Miles City cows and 910 lbs. for Brooksville cows. In addition to weight, height, depth, length, width at shoulders, and width at hooks measurements are taken on all the calves, yearling heifers, and five-year-old cows in both groups. Comparative scores are taken on the condition, conformation, amount of bone, correct rear legs, hair smoothness, hair length, and hair bloom on all the calves, yearlings, and five-year-old cows.

The Miles City cattle that were yearlings or older when shipped to Brooksville are taller, deeper bodied, and wider through the shoulders than the Brooksville cattle. However, measurements of younger animals that have been raised in Brooksville are comparable to those of the Brooksville cattle.

Comparative scores on condition and conformation are about two-thirds of a grade higher for the Brooksville calves. However, this is the only appreciable difference in any of the items scored.

V. FUTURE PLANS:

Blood levels of hematocrit, phosphorus, calcium, and copper will be determined in Hereford cattle of the Montana Line 1 and Brooksville herds in their respective localities. Blood levels of the above constituents will also be determined in cattle exchanged between the two stations. Electrophoretic patterns of hemaglobins, plasma, and serum proteins will be determined in both groups.

VI. PUBLICATIONS DURING THE YEAR:

None

VII. PUBLICATIONS PLANNED:

None

Submitted by: W. C. Burns

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

_ Florida, Brooksville _ State

| Location | Brksvl. | Brksvl. | Brksvl. | Brksvl. | Brksvl. | Brksvl. |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Brahman | Br. Hereford | MC Hereford | MC Hereford | S. Gert. |
| Breed of dam | Angus | Brahman | Br. Hereford | MC Hereford | MC Hereford | S. Gert. |
| Line or group[1] | Purebred | Purebred | Line 4 Purebred | Line 1 Purebred | Line 2 Purebred | Purebred |
| No. cows exposed[2] | 81 | 31 | 27 | 8 | 29 | 38 |
| No. calves born[3] | 62 | 25 | 23 | 7 | 24 | 19 |
| Calving percent, born | 76.5 | 80.6 | 85.2 | 87.5 | 82.8 | 50.0 |
| Av. birth date | 1-02-63 | 1-20-63 | 1-11-63 | 1-27-63 | 1-06-63 | 1-23-63 |
| Av. birth wt. | 52.9 | 55.3 | 60.2 | 64.3 | 58.2 | 69.1 |
| No. calves weaned | 58 | 24 | 20 | 5 | 22 | 17 |
| Calving percent, weaned[4] | 71.6 | 77.4 | 74.1 | 62.5 | 75.9 | 44.7 |
| Av. weaning age, days | 236 | 218 | 227 | 211 | 232 | 215 |
| Adj. ADG[5] | 1.68 | 1.72 | 1.78 | 1.62 | 1.70 | 2.09 |
| Av. type sc.[6] | 12.2 | 11.1 | 12.5 | 10.2 | 11.0 | 10.6 |
| Av. cond. sc.[6] | 10.3 | 9.5 | 11.2 | 8.6 | 9.1 | 9.4 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

| Sex Factors | |
|---|---|
| Bull | 0.96 |
| Steer | 1.00 |
| Heifer | 1.08 |

| Dam Factors | |
|---|---|
| Age: 01 | 1.23 |
| 02 | 1.16 |
| 03 | 1.10 |
| 04 | 1.05 |
| 05 | 1.03 |
| 06-10 | 1.00 |
| 11 | 1.05 |

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Florida, Brooksville State

| | | | | | | |
|---|---|---|---|---|---|---|
| Location | Brksvl. | | | | | |
| Breed of sire | Angus | | | | | |
| Breed of dam | Crossbred | | | | | |
| Line or group[1] | 1/2-Angus-1/2-Brahman | | | | | |
| No. cows exposed[2] | 82 | | | | | |
| No. calves born[3] | 76 | | | | | |
| Calving percent, born | 92.7 | | | | | |
| Av. birth date | 1-06-63 | | | | | |
| Av. birth wt. | 54.1 | | | | | |
| No. calves weaned | 72 | | | | | |
| Calving percent, weaned[4] | 87.8 | | | | | |
| Av. weaning age, days | 232 | | | | | |
| Adj. ADG[5] | 1.83 | | | | | |
| Av. type sc.[6] | 12.1 | | | | | |
| Av. cond. sc.[6] | 10.7 | | | | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed
5 - Indicate adjustments:

| Sex Factors | |
|---|---|
| Bull | 0.96 |
| Steer | 1.00 |
| Heifer | 1.08 |

| Dam Factors | |
|---|---|
| Age: 01 | 1.23 |
| 02 | 1.16 |
| 03 | 1.10 |
| 04 | 1.05 |
| 05 | 1.03 |
| 06-10 | 1.00 |
| 11 | 1.05 |

6 - 15-17 = Fancy
12-14 = Choice
9-10 = Good
6-8 = Medium

FORM II
POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Florida, Brooksville State

| | | | | | | |
|---|---|---|---|---|---|---|
| Location | Brksvl. | Brksvl. | Brksvl. | Brksvl. | Brksvl. | Brksvl. |
| Breed of sire | Angus | Brahman | Br. Here. | MC Here. | MC Here. | S. Gert. |
| Breed of dam | Angus | Brahman | Br. Here. | MC Here. | MC Here. | S. Gert. |
| Line or group[1] | Station | Station | St. Line 4 | St. Line 1 | St. Line 2 | Station |
| Bulls: No. in group | 13 (16-3)[a] | 5 | 11 (14-3)[a] | 2 | 4 | 4 (7-3)[a] |
| Feed regime[2] | | | | | | |
| Av. init. age | 218 | 196 | 224 | 226 | 217 | 205 |
| Av. init. wt. | 427 | 479 | 463 | 380 | 415 | 561 |
| Av.no.da.fed | 365 | 365 | 365 | 365 | 365 | 365 |
| Av. final wt. | 910 | 987 | 1006 | 847 | 982 | 1166 |
| ADG on test | 1.32 | 1.39 | 1.49 | 1.28 | 1.55 | 1.66 |
| Av. type sc. | 10.56 | 9.80 | 10.69 | 8.00 | 10.50 | 9.57 |
| Av. cond. sc. | 9.69 | 9.20 | 8.85 | 6.50 | 8.50 | 8.86 |
| Av. inbreeding | | | | | | |
| Heifers: No. in group | 31 | 12 | 10 | 7 | | 16 |
| Feed regime[2] | | | | | | |
| Av. init. age | 225 | 213 | 217 | 222 | | 223 |
| Av. init. wt. | 403 | 409 | 427 | 353 | | 511 |
| Av.no.da.fed | 365 | 365 | 365 | 365 | | 365 |
| Av. final wt. | 594 | 632 | 655 | 621 | | 783 |
| ADG on test | 0.52 | 0.61 | 0.62 | 0.73 | | 0.74 |
| Av. type sc. | 11.71 | 11.09 | 11.50 | 10.83 | | 11.13 |
| Av. cond. sc. | 7.81 | 7.91 | 8.20 | 7.50 | | 7.27 |
| Av. inbreeding | | | | | | |
| Steers: No. in group | 5 | 2 | 7[b] | | | 10 |
| Feed regime[2] | | | | | | |
| Av. init. age | 191 | 194 | 215 | | | 205 |
| Av. init. wt. | 364 | 378 | 344 | | | 477 |
| Av.no.da.fed | 210 | 210 | 210 | | | 210 |
| Av. final wt. | 627 | 663 | 637 | | | 847 |
| ADG on test | | | | | | |
| Av. type sc. | 10.20 | 9.10 | 9.60 | | | 8.90 |
| Av. cond. sc. | 9.80 | 8.50 | 8.80 | | | 9.20 |
| Av. inbreeding | | | | | | |

1 - Show whether station-owned or cooperator-owned, in addition to other group designation.

| 2 - Feed regime | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | Fed 2% body wt. hay free-choice, 140 days | Limited on pasture | Full-fed on pasture |
| Pounds/day over feeding period | 12 lbs./day, 140 days + 3 lbs. hay; 8 lbs. per day on pasture | 3 lbs./day | 15 lbs./day |
| Ration: | DRY LOT:<br>2 lbs. CSM<br>60% gr. sn. corn<br>20% blackstrap molasses<br>20% CS hulls<br>PASTURE:<br>4 lbs. blackstrap molasses<br>2 lbs. gr. sn. corn<br>0.5 lbs. CSM | blackstrap molasses free choice and 1 lb. CSM for 68 days. | 2 lb. CSM<br>60% gr. sn. corn<br>20% citrus molasses<br>20% CS hulls |

[a]Numbers in parenthesis indicate total number of bulls minus number culled after feeding test.
[b]Includes all Br. and MC Herefords

FORM III
SLAUGHTER DATA, 1963

Florida, Brooksville State

| Location | Brksvl. | Brksvl. | Brksvl. | Brksvl. | | |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Brahman | Hereford | S. Gert. | | |
| Breed of dam | Angus | Brahman | Hereford | S. Gert. | | |
| Line or group | | | | | | |
| Sex | Steer | Steer | Steer | Steer | | |
| Age at slaughter | 401 | 404 | 425 | 415 | | |
| No. slaughtered | 5a | 2a | 7a | 10a | | |
| Days in feedlot | 210 | 210 | 210 | 210 | | |
| Final feed-lot weight | 627 | 663 | 637 | 847 | | |
| Slaughter wt., live | 627 | 663 | 637 | 847 | | |
| Carcass wt., cold | 357 | 380 | 352 | 498 | | |
| Dressing per-cent, cold | 56.94 | 57.31 | 55.26 | 58.79 | | |
| Carcass grade, quality | 9.8 | 8.5 | 8.8 | 9.2 | | |
| Carcass grade, cutability | | | | | | |
| Est. percent, kidney fat | | | | | | |
| Rib-eye area/100 lbs.carc.(sq.in.) | | | | | | |
| Marbling score, USDA | | | | | | |
| Fat thickness over ribeye(in.)[1] | | | | | | |
| W-B shear force, lbs.[2] | | | | | | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

[a]These steers were fed on pasture in two groups to test Vitamin A. No detailed carcass work was done on this trial.

TABLE 1. Growth and Feedlot Data

| Breed | Sire | No. bull calves | Weaned weight | Feedlot daily gain | Final age | Wt./ day of age | Type score |
|---|---|---|---|---|---|---|---|
| PH | 218C | 13 | 492 | 2.66 | 390 | 2.41 | 11.9 |
| PH | 853 | 14 | 494 | 2.73 | 382 | 2.50 | 12.4 |
| PH | 136 | 9 | 413 | 2.54 | 375 | 2.22 | 12.0 |
| PH | R086 | 2 | 405 | 2.31 | 380 | 2.09 | 11.9 |
| PH | 111B | 3 | 408 | 2.69 | 350 | 2.45 | 11.1 |
| PH | 81 | 8 | 452 | 2.61 | 396 | 2.26 | 11.9 |
| A | 934 | 11 | 533 | 2.82 | 400 | 2.52 | 12.7 |
| A | 285 | 8 | 402 | 2.42 | 371 | 2.18 | 11.4 |

TABLE 2. Carcass Data

| Breed | Sire | No. slaughtered | Dressing percent | Av. rib-eye fat thickness | Av. rib-eye area/ cwt. carcass | Carcass wt./day of age | Carcass length |
|---|---|---|---|---|---|---|---|
| PH | 81 | 7 | 56.5 | 0.35 | 2.43 | 1.03 | 41.0 |
| PH | 136 | 6 | 55.6 | 0.34 | 2.56 | 1.03 | 41.9 |

V. FUTURE PLANS:

The project will be continued as outlined.

VI. PUBLICATIONS DURING THE YEAR:

Routine annual reports

VII. PUBLICATIONS PLANNED:

None

Submitted by: W. C. McCormick

I. PROJECT: State 2-99 (S-10)

Selection of Beef Cattle for Single Items of Importance in Profitable Beef Production

II. OBJECTIVES:

To obtain preliminary information on the relative effectiveness of selecting for a single character.

To observe trends in characters for which no selection is made when selection is for a single character.

III. PERSONNEL

W. C. McCormick, T. M. Clyburn, and B. L. Southwell

IV. ACCOMPLISHMENTS DURING THE YEAR:

Four herds of grade Polled Hereford females, owned and maintained by the Georgia State Prison Farm, Reidsville, are used to study selecting for (1) weaning weight, (2) rate of post-weaning gain, (3) weaning score, and (4) average performance. For the latter group, replacements are selected whose records are nearest average for each trait. Bulls used are selected from the Polled Hereford herd at Tifton.

TABLE 1. Weaning Data, 1963 Calf Crop

| Herd | No. calves weaned | Av. birth weight | ADG birth to weaning | Weaning Scores | |
|---|---|---|---|---|---|
| | | | | Type | Condition |
| Foundation Cows | | | | | |
| Wean weight | 34 | 74 | 1.52 | 11.0 | 8.9 |
| Rate of gain | 37 | 74 | 1.51 | 11.4 | 9.1 |
| Score | 30 | 76 | 1.43 | 10.9 | 8.7 |
| Average | 32 | 68 | 1.38 | 10.7 | 8.9 |
| Generation 1 Cows | | | | | |
| Wean weight | 12 | 68 | 1.39 | 10.3 | 8.3 |
| Rate of gain | 10 | 67 | 1.22 | 10.5 | 8.0 |
| Score | 17 | 70 | 1.38 | 10.9 | 8.8 |
| Average | 13 | 68 | 1.23 | 10.6 | 8.6 |

Rate of gain during the post-weaning wintering period - approximately October 15 to April 1 - for heifer calves could not be determined at reporting time. Animals from the 1962 steer calf crop were selected to obtain growth and carcass data. The steers were grazed from November 14 to the following September on small grain and millet pastures.

TABLE 2. Average Performance by Herds

| Herd | ADG, lb. | | Final wt., lb. | Final age, days | Wt./ day of age | Sl. grade | Carcass | | Sq.in. ribeye/ cwt. carcass | Carcass grade | Carcass wt./ day age |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pre-weaning | Post-weaning | | | | | Wt. | L. | | | |
| Wean wt. | 1.71 | 1.75 | 1015 | 559 | 1.82 | 9.7 | 586 | 47.9 | 1.56 | 9.1 | 1.05 |
| Rate of gain | 1.52 | 1.74 | 1017 | 582 | 1.75 | 9.6 | 594 | 48.1 | 1.57 | 8.7 | 1.02 |
| Score | 1.30 | 1.53 | 877 | 583 | 1.50 | 9.0 | 505 | 46.2 | 1.75 | 7.7 | 0.87 |
| Average | 1.40 | 1.62 | 923 | 569 | 1.62 | 9.0 | 534 | 46.5 | 1.78 | 8.6 | 0.93 |

V. FUTURE PLANS:

The project will be continued as outlined. Generation 1 replacements have been selected and foundation females will be discarded.

VI. PUBLICATIONS DURING THE YEAR:

Routine annual reports

VII. PUBLICATIONS PLANNED:

As soon as Generation 1 data are complete, they will be analyzed.

Submitted by: W. C. McCormick

I. PROJECT: Animal Husbandry 209, AHRD Line Project d1-3 (S-10)

A Study of Grading, Crisscrossing, and Rotational Crossing as Breeding Systems for Commercial Beef Production

II. OBJECTIVES:

To study the relative breeding value of grading, crisscrossing, and rotational crossing as breeding systems for commerican beef production.

To study heterotic effects in crosses between Angus and Polled Hereford breeds, as compared to heterosis in crosses between these breeds and Santa Gertrudis, a breed based partially on a Brahman foundation.

To study the comparative value of the Santa Gertrudis breed with the Angus and Polled Hereford breeds.

III. PERSONNEL:

W. C. McCormick, T. M. Clyburn, R. L. Saffle, and B. L. Southwell

IV. ACCOMPLISHMENTS DURING THE YEAR:

TABLE 1. Weaning Data, 1963 Calf Crop, Raised by Foundation Cows

| Herd | Breeding system | No. calves | Av. birth weight | ADG birth to wean. | Av. type score | Av. condition score |
|---|---|---|---|---|---|---|
| Gr. A | Grading up | 26 | 65 | 1.49 | 10.7 | 8.5 |
| Gr. PH | Grading up | 24 | 74 | 1.43 | 10.7 | 8.6 |
| Gr. SG | Grading up | 22 | 72 | 1.88 | 10.1 | 8.8 |
| AxPH | Crisscrossing | 24 | 69 | 1.50 | 10.7 | 8.4 |
| AxSG | Crisscrossing | 26 | 66 | 1.73 | 10.6 | 8.7 |
| PHxSG | Crisscrossing | 22 | 74 | 1.74 | 10.7 | 8.9 |
| AxPHxSG | Rotational crossing | 39 | 72 | 1.73 | 10.9 | 9.0 |

Foundation cows are being replaced with generation 1 animals as rapidly as possible. Weaning data for the 1963 calf crop which was raised by generation 1 animals is shown in table 2.

TABLE 2. Weaning Data, 1963 Calf Crop, Raised by Generation 1 Cows

| Herd | Breeding system | No. calves | Av. birth weight | ADG birth to wean. | Av. type score | Av. condition score |
|---|---|---|---|---|---|---|
| Gr. A | Grading up | 14 | 60 | 1.51 | 10.4 | 7.9 |
| Gr. PH | Grading up | 16 | 68 | 1.39 | 10.5 | 8.3 |
| Gr. SG | Grading up | 15 | 73 | 1.86 | 10.0 | 8.1 |
| AxPH | Crisscrossing | 16 | 64 | 1.53 | 10.5 | 8.2 |
| AxSG | Crisscrossing | 17 | 67 | 1.70 | 10.6 | 8.4 |
| PHxSG | Crisscrossing | 17 | 73 | 1.81 | 10.6 | 8.5 |
| AxPHxSG | Rotational crossing | 22 | 72 | 1.72 | 10.5 | 8.5 |

V. FUTURE PLANS:

Studies will be continued as planned.

VI. PUBLICATIONS DURING THE YEAR:

Routine annual reports.

VII. PUBLICATIONS PLANNED:

The first six years' weaning data for generation 1 animals have been analyzed and are being written for publication. The three years' data on growth and carcass studies have also been analyzed and will be published.

Submitted by: W. C. McCormick

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Georgia State

| Location | Tifton | Tifton | Reidsville | Reidsville | Reidsville | Reidsville |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | P.Hereford | P.Hereford | P.Hereford | P.Hereford | P.Hereford |
| Breed of dam | Angus | P.Hereford | Gr. PH | Gr. PH | Gr. PH | Gr. PH |
| Line or group[1] | Purebred | Purebred | Type Herd | Wean Wt. | Rate of Gain | Average |
| No. cows exposed[2] | 47 | 115 | 53 | 53 | 53 | 55 |
| No. calves born[3] | 36 | 93 | 51 | 48 | 48 | 48 |
| Calving percent, born | 77 | 81 | 96 | 91 | 91 | 87 |
| Av. birth date | 1-31-63 | 1-26-63 | 1-29-63 | 1-30-63 | 1-27-63 | 1-30-63 |
| Av. birth wt. | 64.3 | 71.8 | 73.5 | 72.6 | 72.4 | 68.0 |
| No. calves weaned | 33 | 81 | 47 | 46 | 47 | 45 |
| Calving percent, weaned[4] | 70 | 70 | 89 | 87 | 89 | 82 |
| Av. weaning age, days | 223 | 216 | 241 | 240 | 243 | 240 |
| Adj. ADG[5] | 1.77 | 1.68 | 1.30 | 1.43 | 1.42 | 1.22 |
| Av. type sc.[6] | 11.9 | 11.3 | 10.9 | 10.8 | 11.2 | 10.4 |
| Av. cond. sc.[6] | 9.6 | 9.3 | 8.8 | 8.8 | 8.8 | 8.6 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

NONE

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Georgia State

| Location | Reidsville | Reidsville | Reidsville | Reidsville | Reidsville | Reidsville |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | P.Hereford | S. Gert | A-PH | A-SG | PH-SG |
| Breed of dam | Gr. Angus | Gr. PH | Gr. SG | A x PH | A x SG | PH x SG |
| Line or group[1] | Grade | Grade | Grade | Crisscross | Crisscross | Crisscross |
| No. cows exposed[2] | 41 | 43 | 42 | 42 | 44 | 40 |
| No. calves born[3] | 40 | 40 | 37 | 40 | 43 | 39 |
| Calving percent, born | 96 | 93 | 88 | 95 | 98 | 98 |
| Av. birth date | 1-30-63 | 1-20-63 | 2-16-63 | 1-23-63 | 1-28-63 | 1-28-63 |
| Av. birth wt. | 63.0 | 71.6 | 72.8 | 66.9 | 66.4 | 73.5 |
| No. calves weaned | 40 | 39 | 34 | 39 | 39 | 37 |
| Calving percent, weaned[4] | 96 | 91 | 81 | 93 | 89 | 93 |
| Av. weaning age, days | 231 | 240 | 227 | 241 | 233 | 236 |
| Adj. ADG[5] | 1.46 | 1.41 | 1.87 | 1.51 | 1.71 | 1.77 |
| Av. type sc.[6] | 10.3 | 10.6 | 10.1 | 10.7 | 10.6 | 10.6 |
| Av. cond. sc.[6] | 8.1 | 8.4 | 8.5 | 8.3 | 8.5 | 8.8 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

NONE

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Georgia State

| | | | | | | |
|---|---|---|---|---|---|---|
| Location | Reidsville | | | | | |
| Breed of sire | A-PH-SG | | | | | |
| Breed of dam | AxPHxSG | | | | | |
| Line or group[1] | Rotational cross | | | | | |
| No. cows exposed[2] | 65 | | | | | |
| No. calves born[3] | 61 | | | | | |
| Calving percent, born | 94 | | | | | |
| Av. birth date | 1-26-63 | | | | | |
| Av. birth wt. | 72.1 | | | | | |
| No. calves weaned | 58 | | | | | |
| Calving percent, weaned[4] | 89 | | | | | |
| Av. weaning age, days | 238 | | | | | |
| Adj. ADG[5] | 1.73 | | | | | |
| Av. type sc.[6] | 10.7 | | | | | |
| Av. cond. sc.[6] | 8.8 | | | | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive
4 - Number weaned, divided by number of cows exposed
5 - Indicate adjustments:

NONE

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

# FORM II
# POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Georgia State

| | Location | Tifton | Tifton | Reidsville | Reidsville | Reidsville | Reidsville |
|---|---|---|---|---|---|---|---|
| | Breed of sire | P.Hereford | Angus | P.Hereford | P.Hereford | P.Hereford | P.Hereford |
| | Breed of dam | P.Hereford | Angus | Gr. PH | Gr. PH | Gr. PH | Gr. PH |
| | Line or group[1] | Purebred | Purebred | Wean wt. | Rate-gain | Type | Average |
| Bulls | No. in group | 30 | 21 | | | | |
| | Feed regime[2] | Full-fed | Full-fed | | | | |
| | Av. init. age | 229 | 220 | | | | |
| | Av. init. wt. | 479[a] | 433[a] | | | | |
| | Av.no.da.fed | 168 | 168 | | | | |
| | Av. final wt. | 992[a] | 872[a] | | | | |
| | ADG on test | 3.05 | 2.61 | | | | |
| | Av. type sc. | 11.3[b] | 11.3[b] | | | | |
| | Av. cond. sc. | | | | | | |
| | Av. inbreeding | | | | | | |
| Heifers | No. in group | | | | | | |
| | Feed regime[2] | | | | | | |
| | Av. init. age | | | | | | |
| | Av. init. wt. | | | | | | |
| | Av.no.da.fed | | | | | | |
| | Av. final wt. | | | | | | |
| | ADG on test | | | | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | | | | | | |
| | Av. inbreeding | | | | | | |
| Steers | No. in group | | | 13 | 14 | 11 | 14 |
| | Feed regime[2] | | | Pasture | Pasture | Pasture | Pasture |
| | Av. init. age | | | 271 | 294 | 295 | 281 |
| | Av. init. wt. | | | 511 | 516 | 436 | 457 |
| | Av.no.da.fed | | | 288 | 288 | 288 | 288 |
| | Av. final wt. | | | 1015 | 1017 | 877 | 923 |
| | ADG on test | | | 1.75 | 1.74 | 1.53 | 1.62 |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | | | 9.7[b] | 9.6[b] | 9.0[b] | 9.0[b] |
| | Av. inbreeding | | | | | | |

1 - Show whether station-owned or cooperator-owned, in addition to other group designation.

| 2 - Feed regime | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | Full-fed | | Pasture |
| Pounds/day over feeding period | 23.1 | | |
| Ration: | 940 gr. sn. corn<br>200 gr. oats<br>330 CSM<br>150 molasses<br>350 CS hulls<br>12 limestone<br>8 dicalcium phosphate<br>10 trace mineral salt<br>0.5 Vit. A supplement (10,000 IU/gm.) | | Grazing small grain and millet pasture |

[a]Single weights.
[b]Score averages of 3-5 graders.

FORM III
SLAUGHTER DATA, 1963

Georgia State

| Location | Tifton | Tifton | Tifton | Tifton | | |
|---|---|---|---|---|---|---|
| Breed of sire | P.Hereford | P.Hereford | P.Hereford | P.Hereford | | |
| Breed of dam | P.Hereford | P.Hereford | P.Hereford | P.Hereford | | |
| Line or group | Sire 111B | Sire 111B | Sire 47 Purebred | Sire 47 Purebred | | |
| Sex | Male | Female | Male | Female | | |
| Age at slaughter | 394 | 402 | 395 | 399 | | |
| No. slaughtered | 3 | 7 | 4 | 4 | | |
| Days in feedlot | 168 | 168 | 168 | 168 | | |
| Final feed-lot weight | 961 | 701 | 980 | 769 | | |
| Slaughter wt., live | 961 | 701 | 980 | 769 | | |
| Carcass wt., cold | 561 | 398 | 566 | 430 | | |
| Dressing per-cent, cold | 59.7 | 58.0 | 59.1 | 57.3 | | |
| Carcass grade, quality | 9.7[a] | 10.6[a] | 9.0[a] | 9.5[a] | | |
| Carcass grade, cutability | | | | | | |
| Est. percent kidney fat | | | | | | |
| Rib-eye area/100 lbs.car.(sq.in.) | 2.15 | 2.25 | 2.18 | 2.26 | | |
| Marbling score, USDA | | | | | | |
| Fat thickness over ribeye(in.)[1] | 0.55 | 0.47 | 0.47 | 0.51 | | |
| W-B shear force, lbs.[2] | 4.9 | 3.9 | 4.9 | 3.9 | | |

1 - Use one measure; if not, indicate method.

Average of three measurements

2 - Indicate size of core used and how meat was cooked.

One-half inch

[a]Graded by a member of the USDA Meat Grading Service.

FORM III
SLAUGHTER DATA, 1963

Georgia State

| Location | Reidsville | Reidsville | Reidsville | Reidsville | | |
|---|---|---|---|---|---|---|
| Breed of sire | P.Hereford | P.Hereford | P.Hereford | P.Hereford | | |
| Breed of dam | Gr. PH | Gr. PH | Gr. PH | Gr. PH | | |
| Line or group | Wean Wt. | Rate-Gain | Type | Average | | |
| Sex | Male | Male | Male | Male | | |
| Age at slaughter | 558 | 582 | 583 | 569 | | |
| No. slaughtered | 13 | 14 | 11 | 14 | | |
| Days in feedlot | 288 | 288 | 288 | 288 | | |
| Final feed-lot weight | 1015 | 1017 | 877 | 923 | | |
| Slaughter wt., live | 1015 | 1017 | 877 | 923 | | |
| Carcass wt., cold | 586[a] | 594[a] | 505[a] | 534[a] | | |
| Dressing per-cent, cold | 57.7[a] | 58.4[a] | 57.4[a] | 57.7[a] | | |
| Carcass grade, quality | 9.1[b] | 8.7[b] | 7.7[b] | 8.6[b] | | |
| Carcass grade, cutability | | | | | | |
| Est. percent, kidney fat | | | | | | |
| Rib-eye area/100 lbs.car.(sq.in.) | 1.56 | 1.57 | 1.75 | 1.78 | | |
| Marbling score, USDA | | | | | | |
| Fat thickness over ribeye(in.)[1] | 0.63 | 0.65 | 0.52 | 0.59 | | |
| W-B shear force, lbs.[2] | 5.3 | 6.0 | 6.8 | 6.4 | | |

1 - Use one measure; if not, indicate method.

Average of three measurements

2 - Indicate size of core used and how meat was cooked.

One-half inch

[a]Hot carcass weight and dressing percent reported, rather than cold.
[b]Graded by University meats man.

UNIVERSITY OF KENTUCKY
Agricultural Experiment Station

I. PROJECT: Animal Science 260 (S-10)

Measurement and Selection of Economically Important Traits in Beef Cattle

II. OBJECTIVES:

To use rate of gain, efficiency, conformation, and carcass characteristics in an over-all selection experiment.

To develop a method of estimating a bull's transmitting ability for carcass characteristics, as well as for rate of gain and conformation.

III. PERSONNEL:

N. W. Bradley, D. G. Steele, W. P. Garrigus, and J. D. Kemp

IV. ACCOMPLISHMENTS DURING THE YEAR:

The Hereford herd being used in the revised project has been increased to a total of 227 head of varying ages. Seventy-four calves were born during the first three months of 1964. A total of 127 cows and heifers are presently being bred to calve during January, February, and March of 1965. A progeny test of the first three herd sires has been completed for preweaning performance, postweaning performance, and certain carcass characteristics. Results of the progeny test are presented in tables 1 and 2. The reliability of the progeny test for the bull Silver Prince 194 (SP 194) might be questioned since this bull sired only eight calves. One heifer in this sire group was definitely inferior in appearance and performance to the other calves sired by SP 194; however, data for this heifer are included in the summary. The most notable differences in tables 1 and 2 are the heavier weaning and slaughter weights of calves sired by HP Real Silver 15 (HP RS 15) and the lower shear force values for Silver Husker 15 (SH 15). Calves from three additional sires are presently undergoing preweaning progeny tests. Twenty bull calves from the first calf crop have completed postweaning performance tests and three have been selected for progeny testing.

TABLE 1. Preweaning and Postweaning Performance of Three Sire Groups

| | Sire | | |
|---|---|---|---|
| | SP 194 | SH 15 | HP RS 15 |
| **Preweaning:** | | | |
| No. of calves | 8 | 10 | 10 |
| Sex of calf | | | |
| Steer | 5 | 7 | 7 |
| Heifer | 3 | 3 | 3 |
| Av. age, days | 252 | 255 | 258 |
| Weaning wt., lbs. | 411 | 400 | 440 |
| ADG, lbs. | 1.37 | 1.34 | 1.45 |
| Adj. ADG, lbs.[1] | 1.54 | 1.50 | 1.63 |
| Type score | 13.3 | 13.4 | 13.8 |
| Index[2] | 110 | 109 | 116 |
| **Postweaning - 217 days:** | | | |
| No. of calves | 8 | 10 | 10 |
| Initial wt., lbs. | 448 | 482 | 503 |
| Final wt., lbs. | 820 | 888 | 939 |
| ADG. lbs. | 1.71 | 1.87 | 2.01 |
| Type score | 12.2 | 13.1 | 12.4 |

[1]Adjusted for age of dam, sex of calf, and season of birth.
[2]Based on wt./day of age and type score (50:50).

TABLE 2. Carcass Characteristics of Three Sire Groups

| | Sire | | |
|---|---|---|---|
| | SP 194 | SH 15 | HP RS 15 |
| No. of calves | 8 | 10 | 10 |
| Sex of calf: Steer | 5 | 7 | 7 |
| Heifer | 3 | 3 | 3 |
| Carcass grade | 9.9 | 10.9 | 11.3 |
| Cold carcass wt., lbs. | 485 | 517 | 554 |
| Carcass conformation | 10.5 | 11.4 | 12.1 |
| Dressing percent[1] | 59.8 | 59.6 | 60.2 |
| Fat thickness over rib eye, in. | 0.6 | 0.7 | 0.6 |
| Rib-eye area, sq. in. | 10.2 | 10.1 | 11.1 |
| Rib-eye area/cwt. carcass, sq. in. | 2.11 | 1.95 | 2.00 |
| Marbling score[2] | 4.0 | 4.6 | 4.9 |
| Physical separation, 9-10-11th ribs: | | | |
| Fat, percent | 33.2 | 40.2 | 37.6 |
| Rib-eye, percent | 19.7 | 18.6 | 20.3 |
| Other lean, percent | 29.6 | 28.4 | 28.6 |
| Total lean, percent | 49.3 | 46.9 | 48.9 |
| Bone, percent | 14.2 | 12.1 | 12.9 |
| $H_2O$ in eye, percent | 73.1 | 72.7 | 72.2 |
| Ether extract in eye, percent | 3.2 | 4.3 | 4.4 |

TABLE 2. Continued

| | Sire | | |
|---|---|---|---|
| | SP 194 | SH 15 | HP RS 15 |
| Flavor score[3] | 7.7 | 8.2 | 8.3 |
| Tenderness score[3] | 7.5 | 8.2 | 8.1 |
| Juiciness score[3] | 8.0 | 8.1 | 8.2 |
| Over-all satisfaction[3] | 7.9 | 8.2 | 8.2 |
| W-B Shear force, lbs.[4] | 20.6 | 16.8 | 18.0 |

1 - 6-hour shrunk weight (3-hour haul) and 72-hour cold weight
2 - 4 = slight; 5 = small
3 - The higher the number, the more desirable
4 - One-inch cores

V. FUTURE PLANS:

Future plans are to proceed according to the project outline as rapidly and as extensively as time and facilities permit.

VI. PUBLICATIONS:

Varney, W. Y., J. D. Kemp, and N. W. Bradley. 1963. Effect of sire, breed, and sex on carcass characteristics of beef cattle. Animal Science Research Reports.

VII. PUBLICATIONS PLANNED:

Results will be published annually in the Kentucky Animal Science Research Reports and elsewhere as justified.

Submitted by: N. W. Bradley

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Kentucky State

| Location | Princeton | Eden Shale | | | | |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | | | | |
| Breed of dam | Hereford | Hereford | | | | |
| Line or group[1] | Purebred | Purebred | | | | |
| No. cows exposed[2] | 35 | 32 | | | | |
| No. calves born[3] | 30 | 27 | | | | |
| Calving percent, born | 85.7 | 84.4 | | | | |
| Av. birth date | 2-08-63 | 2-08-63 | | | | |
| Av. birth wt. | 62 | 57 | | | | |
| No. calves weaned | 27 | 23 | | | | |
| Calving percent, weaned[4] | 77.1 | 71.9 | | | | |
| Av. weaning age, days | 235 | 261 | | | | |
| Adj. ADG[5] | 1.63 | 1.62 | | | | |
| Av. type sc.[6] | 12.0 | 12.0 | | | | |
| Av. cond. sc.[6] | | | | | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

Age of dam
Sex of calf
Season of birth

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Kentucky State

| | Location | Coldstream | Princeton | Quicksand | Quicksand | Quicksand | Quicksand |
|---|---|---|---|---|---|---|---|
| | Breed of sire | Hereford | Hereford | Hereford | P.Hereford | Angus | Shorthorn |
| | Breed of dam | Hereford | Hereford | Hereford | P.Hereford | Angus | Shorthorn |
| | Line or group[1] | Station | Station | Co-op | Co-op | Co-op | Co-op |
| Bulls | No. in group | 20 | | 12 | 11 | 8 | 2 |
| | Feed regime[2] | | | | | | |
| | Av. init. age | 279 | | 250 | 248 | 268 | 217 |
| | Av. init. wt. | 457 | | 494 | 562 | 560 | 462 |
| | Av.no.da.fed | 154 | | 150 | 150 | 150 | 150 |
| | Av. final wt. | 805 | | 821 | 923 | 892 | 834 |
| | ADG on test | 2.26 | | 2.18 | 2.41 | 2.21 | 2.48 |
| | Av. type sc. | 12.2 | | 12.5 | 12.6 | 12.9 | 12.6 |
| | Av. cond. sc. | | | | | | |
| | Av. inbreeding | | | | | | |
| Heifers | No. in group | 12 | 26 | | | | |
| | Feed regime[2] | | | | | | |
| | Av. init. age | 317 | 252 | | | | |
| | Av. init. wt. | 464 | 413 | | | | |
| | Av.no.da.fed | 217 | 162 | | | | |
| | Av. final wt. | 835 | 608 | | | | |
| | ADG on test | 1.71 | 1.20 | | | | |
| | Av. type sc. | 13.0 | 12.0 | | | | |
| | Av. cond. sc. | 12.4 | | | | | |
| | Av. inbreeding | | | | | | |
| Steers | No. in group | 28 | | | | | |
| | Feed regime[2] | | | | | | |
| | Av. init. age | 318 | | | | | |
| | Av. init. wt. | 497 | | | | | |
| | Av.no.da.fed | 217 | | | | | |
| | Av. final wt. | 936 | | | | | |
| | ADG on test | 2.02 | | | | | |
| | Av. type sc. | 12.6 | | | | | |
| | Av. cond. sc. | 11.5 | | | | | |
| | Av. inbreeding | | | | | | |

1 - Show whether station-owned or cooperator-owned, in addition to other group designation.

| 2 - Feed regime | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | Self-fed | Limited-fed | Full-fed |
| Pounds/day over feeding period | 18.24 | 8.4 lbs. alfalfa hay<br>4.9 lbs. corn | 17.26 |
| Ration: | 850 lbs. gr. sh. corn<br>650 lbs. gr. corn cobs<br>235 lbs. SBOM (44%)<br>200 lbs. molasses<br>50 lbs. alfalfa leaf meal<br>10 lbs. trace mineral salt<br>5 lbs. dical. phos.<br>1 M I.U. Vit. A palmitate/ton | | 904 lbs. gr. sh. corn<br>922 lbs. corn silage<br>174 lbs. SBOM (44%) |

# FORM II
# POSTWEANING PERFORMANCE OF CALVES FED IN 1963

_ Kentucky _ State

| | Location | Princeton | Princeton | Princeton | Princeton | Princeton | |
|---|---|---|---|---|---|---|---|
| | Breed of sire | Hereford | P.Hereford | Angus | Shorthorn | Charolais | |
| | Breed of dam | Hereford | P.Hereford | Angus | Shorthorn | Charolais | |
| | Line or group[1] | Co-op | Co-op | Co-op | Co-op | Co-op | |
| Bulls | No. in group | 12 | 21 | 31 | 4 | 4 | |
| | Feed regime[2] | | | | | | |
| | Av. init. age | 251 | 241 | 238 | 236 | 242 | |
| | Av. init. wt. | 567 | 564 | 547 | 586 | 682 | |
| | Av.no.da.fed | 150 | 150 | 150 | 150 | 150 | |
| | Av. final wt. | 955 | 932 | 902 | 941 | 1051 | |
| | ADG on test | 2.59 | 2.45 | 2.37 | 2.37 | 2.46 | |
| | Av. type sc. | 13.2 | 12.5 | 12.9 | 13.7 | 11.3 | |
| | Av. cond sc. | | | | | | |
| | Av. inbreeding | | | | | | |
| Heifers | No. in group | | | | | | |
| | Feed regime[2] | | | | | | |
| | Av. init. age | | | | | | |
| | Av. init. wt. | | | | | | |
| | Av.no.da.fed | | | | | | |
| | Av. final wt. | | | | | | |
| | ADG on test | | | | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | | | | | | |
| | Av. inbreeding | | | | | | |
| Steers | No. in group | | | | | | |
| | Feed regime[2] | | | | | | |
| | Av. init. age | | | | | | |
| | Av. init. wt. | | | | | | |
| | Av.no.da.fed | | | | | | |
| | Av. final wt. | | | | | | |
| | ADG on test | | | | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | | | | | | |
| | Av. inbreeding | | | | | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

| 2 - Feed regime | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | Self-fed | | |
| Pounds/day over feeding period | | | |
| Ration: | 850 lbs. gr. sh. corn<br>650 lbs. gr. corn cobs<br>235 lbs. SBOM (44%)<br>200 lbs. molasses<br>50 lbs. alfalfa leaf meal<br>10 lbs. trace mineral salt<br>5 lbs. dical. phos.<br>1 M I.U. Vit. A palmitate/ton | | |

FORM III
SLAUGHTER DATA, 1963

Kentucky State

| Location | Coldstream | Coldstream | | | | |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | | | | |
| Breed of dam | Hereford | Hereford | | | | |
| Line or group | Station | Station | | | | |
| Sex | Steer | Steer | | | | |
| Age at slaughter | 536 | 535 | | | | |
| No. slaughtered | 28 | 12 | | | | |
| Days in feedlot | 217 | 217 | | | | |
| Final feed-lot weight | 936 | 835 | | | | |
| Slaughter wt., live | 914 | 813 | | | | |
| Carcass wt., cold | 549 | 490 | | | | |
| Dressing per-cent, cold | 60.07[a] | 60.27[a] | | | | |
| Carcass grade, quality | 10.6[b] | 11.9[b] | | | | |
| Carcass grade cutability | 3.0[b] | 4.0[b] | | | | |
| Est. percent kidney fat | 2.6[b] | 3.2[b] | | | | |
| Rib-eye area/100 lbs.car.(sq.in.) | 2.04 | 1.91 | | | | |
| Marbling score, USDA | 4.27 | 5.75 | | | | |
| Fat thickness over ribeye(in.)[1] | 0.59 | 0.78 | | | | |
| W-B shear force, lbs.[2] | 18.28 | 20.53 | | | | |

1 - Use one measure; if not, indicate method.

Average of three measures

2 - Indicate size of core used and how meat was cooked.

1" core, roasted at 325° to an internal temperature of 160° in an electric oven.

[a]Six-hour shrunk weight (3-hour haul) and 72-hour cold weight.
[b]Federal grader.

LOUISIANA STATE UNIVERSITY
Agricultural Experiment Station

I. PROJECT: 605 (S-10)

Comparison of Various Crossbred Cattle Under Gulf Coast Conditions with Respect to Rate of Growth on Pasture, Fattening Ability, and Meat Quality of Steers

II. OBJECTIVES:

To study types and breeds of beef cattle to determine which are best suited to Gulf Coast conditions, with respect to rate of growth, fattening ability, and meat quality.

To study various crossbreeding programs as to practicality, production, and usefulness.

To study the amount of hybrid vigor obtained through crossing beef breeds and to ascertain how much of this hybrid vigor is maintained through subsequent backcrossing, multiple-breed crossing, and rotational crossing.

To study the productive ability of dams of various breeds and breed crosses.

To estimate genetic parameters.

To study practical problems of management and marketing of crossbred cattle in the Gulf Coast area.

III. PERSONNEL:

Noah England, A. M. Mullins, R. F. Boulware, C. C. Phillips, and Dorothy Wilson

IV. ACCOMPLISHMENTS DURING THE YEAR:

Data collected during the years 1953 through 1962 from the beef cattle crossbreeding project were analyzed using the least squares method of fitting constants. The primary objectives of these analyses were to determine the effect of breed of dam, age of dam, time of calving, and weight change during the winter upon conception rate during the subsequent breeding season. Conception rate was defined as the percentage of cows pregnant approximately 60 days after the end of the breeding season. Twenty-four types of purebred and crossbred dams and six breeds of sire were represented in this study.

Mean conception rate by breed of dam is given in table 1. Reciprocal crosses have been combined in this table. It is evident that crossbreeding

results in a considerable improvement in this component of fertility. It is also evident that wide crosses are much superior in conception rate to those crossbred dams resulting from crosses between more closely related breeds. The higher percentage calf crop, coupled with heavier weaning weight of calves, gives crossbred cows a substantial advantage over pure-bred cows in pounds of calf weaned per cow bred. British-Brahman, British-Charolais, and Charolais-Brahman cows were particularly good in total production as measured by pounds of calf weaned per cow bred.

These analyses have also revealed that cows which calve early in the season are more likely to conceive during the subsequent breeding season. The 90-day calving season was divided into three 30-day periods for the purpose of analysis. Least square means for conception rate were: 84 percent, 77 percent, and 71 percent, for cows calving during the first, second, and third periods, respectively. Cows which were dry during the breeding season had a conception rate of 68 percent.

Very strong evidence indicates that there is an interaction between breed of dam and lactation status, with respect to calving percentage. Dry British and crossbred cows are less likely to conceive than those which are wet when bred. On the other hand, Brahman cows which were dry during the breeding season had a higher conception rate than did Brahman cows which were wet.

A three-year summary of the data from the beef cattle crossbreeding project is given in tables 2 and 3. The study on age of puberty was also continued, and rankings of the various breeds and breed crosses with respect to age at puberty are identical to those reported for 1962-1963. All half-breed cows were removed from the backcross Charolais herd. This herd now consists of 45 head of 3/4 and 7/8 Charolais cows.

A number of rotational-cross calves have been born. Additional three-breed cross heifers are being mated to the appropriate breed of sire to obtain larger numbers of rotational-cross calves in succeeding years.

TABLE 1. Average Conception Rate and Weaning Weight by Breed of Dam

| Breed of dam | Percent conception[1] | Adj. 205-day wt. of calves[2] |
|---|---|---|
| Angus | 57.4 | 396.0 |
| Brahman | 62.9 | 435.4 |
| Brangus | 64.0 | 446.2 |
| Hereford | 56.9 | 394.8 |
| Average of all breeds | 60.2 | 419.6 |
| Angus x Brahman | 81.0[a] | 446.9 |
| Angus x Brangus | 72.8[a] | 416.3 |
| Angus x Hereford | 74.2[a] | 384.1 |
| Brahman x Brangus | 80.1[a] | 433.4 |

TABLE 1. Continued

| Breed of dam | Percent conception[1] | Adj. 205-day wt. of calves[2] |
|---|---|---|
| Brahman x Hereford | 90.2[a] | 468.4 |
| Brangus x Hereford | 82.4[a] | 445.1 |
| Charolais x Angus | 94.5 | 414.3 |
| Charolais x Brahman | 68.8 | 528.5 |
| Charolais x Brangus | 81.4 | 452.1 |
| Charolais x Hereford | 96.9 | 446.5 |
| Shorthorn x Angus | 57.0 | 339.6 |
| Shorthorn x Brahman | 84.2 | 437.1 |
| Shorthorn x Brangus | 77.4 | 397.0 |
| Shorthorn x Hereford | 88.9 | 368.2 |

[1]Least square means.
[2]Adjusted for age of dam, age and sex of calf.

[a]Includes reciprocals

TABLE 2. Summary of Calf Performance by System of Mating

| Group | Number of calves | 205-day wt. adj. sex calf age dam[1] | Feeder grade | Rate of gain on feed[1,2] | Carcass grade[2] |
|---|---|---|---|---|---|
| Straightbreds | 93 | 390 | Good (9.8) | 1.92 | H-Good |
| Single crosses | 155 | 418 | Good (10.3) | 2.15 | H-Good |
| Backcrosses | 195 | 459 | H-Good (10.5) | 2.06 | H-Good |
| 3-breed crosses | 194 | 463 | H-Good (10.7) | 2.10 | L-Choice |

[1]Least square means - adjusted for breed of sire.
[2]Two-year averages.

TABLE 3. Summary of Performance by Breed of Sire

| Group | Number of calves | 205-day wt. adj. sex calf age dam | Feeder grade | Rate of gain on feed | Carcass grade[1] |
|---|---|---|---|---|---|
| Angus | 103 | 409.8 | Good+ (10.6) | 2.05 | L-Choice |
| Brahman | 99 | 446.2 | Good (9.5) | 1.94 | Good |
| Brangus | 103 | 436.3 | Good (10.2) | 2.10 | H-Good |
| Charolais | 126 | 483.7 | Good (10.4) | 2.24 | H-Good |
| Hereford | 83 | 423.5 | Good+ (11.2) | 2.13 | H-Good |
| Shorthorn | 103 | 426.2 | Good+ (11.0) | 2.01 | L-Choice |

[1]Two-year averages.

V. FUTURE PLANS:

The beef cattle crossbreeding project is scheduled for review, and it is anticipated that some revision will be made.

VI. PUBLICATIONS DURING THE YEAR:

England, Noah and G. L. Robertson. 1964. Crossbreeding for beef production. Louisiana Agriculture 7:12.

England, Noah, G. L. Robertson, and J. S. Sullivan. 1963. A comparison of four mating systems for beef cattle production. J. Animal Sci. 22:817 (abs.).

England, Noah, R. S. Temple, and B. R. Farthing. 1963. The effect of breed of dam and lactation status upon conception rate in beef cattle. J. Animal Sci. 22:818 (abs.).

Fourth Livestock Producers' Day Report. 1964. Animal Science Department, Louisiana State University and Agricultural Experiment Station.

Franks, R. E., E. C. Burns, and N. C. England. 1964. Color preference of the horn flies, haematobic irritans, on beef cattle. J. Economic Entomology 57:371 (abs.).

Schilling, P. E. 1964. Factors affecting reproduction in beef cattle. Master's Thesis, Louisiana State University, Baton Rouge, Louisiana.

VII. PUBLICATIONS PLANNED:

Comparative performance of reciprocal crosses.

Growth from birth to weaning of purebred calves, crossbred calves on purebred cows, and crossbred calves on crossbred cows.

Submitted by: Noah England

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Louisiana State

| Location | Baton Rouge | Baton Rouge | Baton Rouge | Baton Rouge | Baton Rouge | Baton Rouge |
|---|---|---|---|---|---|---|
| Breed of sire | Charolais 057 | Charolais 057 | Charolais "Mac" | Charolais "Mac" | Hereford 132 | Hereford 132 |
| Breed of dam | (a) | (a) | (a) | (a) | (a) | (a) |
| Line or group | Straight-breds | Single crosses | Straight-breds | Single crosses | Straight-breds | Single crosses |
| No. cows exposed[2] | 7 | 19 | 7 | 19 | 12 | 10 |
| No. calves born[3] | 4 | 17 | 7 | 18 | 10 | 7 |
| Calving per-cent, born | 57.1 | 89.5 | 100.0 | 94.7 | 83.3 | 70.0 |
| Av. birth date | 2-13-63 | 2-10-63 | 2-12-63 | 2-14-63 | 2-13-63 | 2-09-63 |
| Av. birth wt. | 67.2 | 76.1 | 68.6 | 76.0 | 62.1 | 68.0 |
| No. calves weaned | 4 | 16 | 6 | 18 | 10 | 7 |
| Calving per-cent, weaned[4] | 57.1 | 84.2 | 85.7 | 94.7 | 83.3 | 70.0 |
| Av. weaning age, days | 217 | 221 | 218 | 216 | 218 | 221 |
| Adj. ADG[5] | 1.70 | 1.93 | 1.73 | 1.95 | 1.37 | 1.76 |
| Av. type sc.[6] | 10.92 | 11.69 | 11.39 | 11.94 | 10.96 | 11.29 |
| Av. cond. sc.[6] | 8.67 | 9.25 | 9.11 | 9.31 | 8.52 | 8.86 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

No adjustments - actual gain, birth to weaning.

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

(a) Dams used were: Straightbreds - Angus, Brahman, Brangus, and Hereford
Single crosses - A-B, A-BA, A-H; B-A, B-BA, B-H; BA-A, BA-B, BA-H; H-A, H-B, H-BA; C-A, C-B, C-BA, C-H; and S-A, S-B, S-BA, S-H.

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Louisiana State

| Location | Baton Rouge | Baton Rouge | Baton Rouge | Baton Rouge | Baton Rouge | Baton Rouge |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford 801 | Hereford 801 | Shorthorn 1159 | Shorthorn 1159 | Shorthorn 158 | Shorthorn 158 |
| Breed of dam | (a) | (a) | (a) | (a) | (a) | (a) |
| Line or group[1] | Straight-breds | Single crosses | Straight-breds | Single crosses | Straight-breds | Single crosses |
| No. cows exposed[2] | 12 | 11 | 8 | 20 | 8 | 19 |
| No. calves born[3] | 8 | 7 | 7 | 17 | 3 | 16 |
| Calving per-cent, born | 66.7 | 63.6 | 87.5 | 85.0 | 37.5 | 84.2 |
| Av. birth date | 2-22-63 | 2-13-62 | 2-10-63 | 2-16-63 | 2-05-63 | 2-13-63 |
| Av. birth wt. | 64.1 | 69.6 | 67.1 | 71.7 | 60.7 | 68.6 |
| No. calves weaned | 8 | 7 | 7 | 17 | 3 | 15 |
| Calving per-cent, weaned[4] | 66.7 | 63.6 | 87.5 | 85.0 | 37.5 | 78.9 |
| Av. weaning age, days | 207 | 217 | 220 | 214 | 225 | 217 |
| Adj. ADG[5] | 1.50 | 1.84 | 1.50 | 1.67 | 1.60 | 1.68 |
| Av. type sc.[6] | 11.46 | 12.09 | 11.00 | 11.63 | 11.00 | 11.49 |
| Av. cond. sc.[6] | 8.75 | 9.67 | 8.52 | 9.22 | 8.67 | 9.04 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

No adjustments - actual gain, birth to weaning

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

(a) Dams used were: Straightbreds - Angus, Brahman, Brangus, and Hereford. Single crosses - A-B, A-BA, A-H; B-A, B-BA, B-H; BA-A, BA-B, BA-H; H-A, H-B, H-BA; C-A, C-B, C-BA, C-H; and S-A, S-B, S-BA, S-H.

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Louisiana State

| Location | Baton Rouge | Baton Rouge | Baton Rouge | Baton Rouge | Baton Rouge | Baton Rouge |
|---|---|---|---|---|---|---|
| Breed of sire | Angus 017 | Angus 017 | Angus 333 | Angus 333 | Brahman 368 | Brahman 368 |
| Breed of dam | (a) | (a) | (a) | (a) | (a) | (a) |
| Line or group[1] | Straight-breds | Single crosses | Straight breds | Single crosses | Straight breds | Single crosses |
| No. cows exposed[2] | 14 | 11 | 13 | 12 | 11 | 12 |
| No. calves born[3] | 6 | 7 | 7 | 9 | 5 | 10 |
| Calving per-cent, born | 42.9 | 63.6 | 53.8 | 75.0 | 45.5 | 83.3 |
| Av. birth date | 2-17-63 | 3-11-63 | 2-12-63 | 2-08-63 | 3-07-63 | 2-27-63 |
| Av. birth wt. | 52.2 | 61.1 | 56.9 | 68.1 | 71.2 | 81.3 |
| No. calves weaned | 5 | 7 | 7 | 9 | 5 | 10 |
| Calving per-cent, weaned[4] | 35.7 | 63.6 | 53.8 | 75.0 | 45.5 | 83.3 |
| Av. weaning age, days | 211 | 191 | 216 | 222 | 195 | 205 |
| Adj. ADG[5] | 1.54 | 1.68 | 1.41 | 1.73 | 1.68 | 1.82 |
| Av. type sc.[6] | 11.80 | 11.67 | 10.50 | 11.89 | 9.67 | 10.67 |
| Av. cond. sc.[6] | 9.13 | 9.29 | 8.00 | 9.48 | 7.60 | 8.45 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

No adjustments - actual gain, birth to weaning

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

(a) Dams used were: Straightbreds - Angus, Brahman, Brangus, and Hereford
Single crosses - A-B, A-BA, A-H; B-A, B-BA, B-H; BA-A, BA-B, BA-H; H-A, H-B, H-BA; C-A, C-B, C-BA, C-H; and S-A, S-B, S-BA, S-H.

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Louisiana State

| Location | Baton Rouge | Baton Rouge | Baton Rouge | Baton Rouge | Baton Rouge | Baton Rouge |
|---|---|---|---|---|---|---|
| Breed of sire | Brahman 1258 | Brahman 1258 | Brangus 513 | Brangus 513 | Brangus 787 | Brangus 787 |
| Breed of dam | (a) | (a) | (a) | (a) | (a) | (a) |
| Line or group[1] | Straight-breds | Single crosses | Straight-breds | Single crosses | Straight-breds | Single crosses |
| No. cows exposed[2] | 12 | 13 | 13 | 12 | 14 | 12 |
| No. calves born | 9 | 13* | 9 | 8 | 10 | 9 |
| Calving per-cent, born | 75.0 | 100.0 | 69.2 | 66.7 | 71.4 | 75.0 |
| Av. birth date | 3-03-63 | 3-03-63 | 2-25-63 | 2-22-63 | 2-21-63 | 2-13-63 |
| Av. birth wt. | 78.1 | 76.2 | 73.0 | 72.1 | 64.6 | 69.7 |
| No. calves weaned | 8 | 10 | 8 | 8 | 10 | 8 |
| Calving per-cent, weaned[4] | 66.7 | 76.9 | 61.5 | 66.7 | 71.4 | 66.7 |
| Av. weaning age, days | 197 | 198 | 201 | 208 | 209 | 217 |
| Adj. ADG[5] | 1.82 | 1.96 | 1.64 | 1.78 | 1.60 | 1.75 |
| Av. type sc.[6] | 10.33 | 10.50 | 10.71 | 11.38 | 10.53 | 10.96 |
| Av. cond. sc.[6] | 8.21 | 8.37 | 8.05 | 8.67 | 8.20 | 8.33 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

No adjustments - actual gain, birth to weaning.

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

(a) Dams used were: Straightbreds - Angus, Brahman, Brangus, and Hereford
Single crosses - A-B, A-BA, A-H; B-A, B-BA, B-H; BA-A, BA-B, BA-H; H-A, H-B, H-BA; C-A, C-B, C-BA, C-H; and S-A, S-B, S-BA, S-H.

*Twin calves in this group.

# FORM II
# POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Louisiana State

| Location | BatonRouge | BatonRouge | BatonRouge | BatonRouge | BatonRouge | BatonRouge |
|---|---|---|---|---|---|---|
| Breed of sire | Angus 333 | Angus 660 | Brahman411 | Brahman1258 | Brangus787 | Brangus666 |
| Breed of dam | (a) | (a) | (a) | (a) | (a) | (a) |
| Line or group | (b) | (b) | (b) | (b) | (b) | (b) |
| **Bulls** | | | | | | |
| No. in group | | | | | | |
| Av. init. age | | | | | | |
| Av. init. wt. | | | | | | |
| Av. no.da.fed | | | | | | |
| Av. final wt. | | | | | | |
| ADG on test | | | | | | |
| Av. type sc. | | | | | | |
| Av. cond. sc. | | | | | | |
| Av. inbreeding | | | | | | |
| **Heifers** | | | | | | |
| No. in group | | | | | | |
| Av. init. age | | | | | | |
| Av. init. wt. | | | | | | |
| Av.no.da.fed | | | | | | |
| Av. final wt. | | | | | | |
| ADG on test | | | | | | |
| Av. type sc. | | | | | | |
| Av. cond. sc. | | | | | | |
| Av. inbreeding | | | | | | |
| **Steers** | | | | | | |
| No. in group | 10 | 7 | 12 | 9 | 14 | 16 |
| Av. init. age(c) | 268 | 261 | 256 | 264 | 262 | 271 |
| Av. init. wt. | 514.0 | 483.6 | 523.3 | 552.2 | 531.1 | 525.6 |
| Av.no.da.fed | 168 | 168 | 168 | 168 | 168 | 168 |
| Av. final wt. | 903.5 | 840.0 | 842.5 | 976.7 | 931.8 | 874.4 |
| ADG on test | 2.32 | 2.11 | 1.89 | 2.52 | 2.38 | 2.08 |
| Av. type sc. | | | | | | |
| Av. cond. sc. | 11.02 | 12.32 | 9.70 | 9.83 | 9.45 | 10.92 |
| Av. inbreeding | | | | | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

Station-owned

| 2 - Feed regime | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | | | Full-fed concentrate ration |
| Pounds/day over feeding period | | | 18.6 lbs./head/day |
| Ration: | | | [Pelletized ration - 3/8" pellets] |
| | | | 2 parts steel-cut y. corn |
| | | | 1 1/2 parts cr. oats |
| | | | 1 part wheat bran |
| | | | 1/2 part CSM |
| | | | 1 part deh. alfalfa leaf meal |

(a) Dams used: Straightbreds - Angus, Brahman, Brangus and Hereford
Single crosses - A-B, A-BA, A-H; B-A, B-BA, B-H; BA-A, BA-B, BA-H; H-A, H-B, H-BA; C-A, C-B, C-BA, C-H; and S-A, S-B, S-BA, S-H.

(b) Groups are as indicated by sire listed above.

(c) Av. init. age = weaning age + 57 days; limited fed conc. ration listed above + hay free choice for this 57-day period.

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Louisiana State

| | Location | BatonRouge | BatonRouge | BatonRouge | BatonRouge | BatonRouge | BatonRouge |
|---|---|---|---|---|---|---|---|
| | Breed of sire | Ch. 037 | Ch. 096 | Here. 72 | Here. 801 | S'horn 158 | S'horn W-2 |
| | Breed of dam | (a) | (a) | (a) | (a) | (a) | (a) |
| | Line or group[1] | (b) | (b) | (b) | (b) | (b) | (b) |
| Bulls | No. in group | | | | | | |
| | Av. init. age | | | | | | |
| | Av. init. wt. | | | | | | |
| | Av.no.da.fed | | | | | | |
| | Av. final wt. | | | | | | |
| | ADG on test | | | | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | | | | | | |
| | Av. inbreeding | | | | | | |
| Heifers | No. in group | | | | | | |
| | Av. init. age | | | | | | |
| | Av. init. wt. | | | | | | |
| | Av.no.da.fed | | | | | | |
| | Av. final wt. | | | | | | |
| | ADG on test | | | | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | | | | | | |
| | Av. inbreeding | | | | | | |
| Steers | No. in group | 4 | 3 | 9 | 9 | 9 | 9 |
| | Av. init age(c) | 260 | 245 | 263 | 259 | 257 | 275 |
| | Av. init. wt. | 587.5 | 516.7 | 507.2 | 478.9 | 507.8 | 497.2 |
| | Av.no.da.fed | 168 | 168 | 168 | 168 | 168 | 168 |
| | Av. final wt. | 977.5 | 916.7 | 891.7 | 860.0 | 901.1 | 843.9 |
| | ADG on test | 2.32 | 2.38 | 2.28 | 2.26 | 2.34 | 2.06 |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | 9.68 | 10.83 | 11.38 | 11.02 | 11.25 | 11.91 |
| | Av. inbreeding | | | | | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

2 - Feed regime

| | *Station-owned* Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full limited, etc. | | | Full-fed concentrate ration |
| Pounds/day over Feeding period | | | 18.6 lbs./head/day |

Ration:

[Pelletized ration, 3/8" pellets]
2 part steel-cut y. corn
1 1/2 part cr. oats
1 part wheat bran
1 1/2 part CSM
1 part dey. alfalfa leaf meal

(a) Dams used: Straightbreds - Angus, Brahman, Brangus, and Hereford
Single crosses - A-B, A-BA, A-H; B-A, B-BA, B-H; BA-A, BA-B, BA-H; H-A H-B, H- BA; C-A, C-B, C-BA, C-H; and S-A, S-B, S-BA, S-H.

(b) Groups are as indicated by sire listed above.

(c) Av. init. age = weaning age + 57 days; limited fed conc. ration listed above + hay free choice for this 57-day period.

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Louisiana State

| | | | | | | |
|---|---|---|---|---|---|---|
| Location | BatonRouge | BatonRouge | BatonRouge | BatonRouge | | |
| Breed of sire | (a) | (a) | (a) | (a) | | |
| Breed of dam | (b) | (b) | (b) | (b) | | |
| Line or group[1] | St.bred | Sing.cr. | Backcross | 3-br.cross | | |
| Bulls: No. in group | | | | | | |
| Bulls: Av. init. age | | | | | | |
| Bulls: Av. init. wt. | | | | | | |
| Bulls: Av.no.da.fed | | | | | | |
| Bulls: Av. final wt. | | | | | | |
| Bulls: ADG on test | | | | | | |
| Bulls: Av. type sc. | | | | | | |
| Bulls: Av. cond. sc. | | | | | | |
| Bulls: Av. inbreeding | | | | | | |
| Heifers: No. in group | | | | | | |
| Heifers: Av. init. age | | | | | | |
| Heifers: Av. init. wt. | | | | | | |
| Heifers: Av.no.da.fed | | | | | | |
| Heifers: Av. final wt. | | | | | | |
| Heifers: ADG on test | | | | | | |
| Heifers: Av. type sc. | | | | | | |
| Heifers: Av. cond. sc. | | | | | | |
| Heifers: Av. inbreeding | | | | | | |
| Steers: No. in group | 15 | 33 | 33 | 30 | | |
| Steers: Av. init. age(c) | 256 | 208 | 209 | 206 | | |
| Steers: Av. init. wt. | 472.7 | 489.8 | 539.7 | 545.8 | | |
| Steers: Av.no.da.fed | 168 | 168 | 168 | 168 | | |
| Steers: Av. final wt. | 821.3 | 872.1 | 915.0 | 922.8 | | |
| Steers: ADG on test | 2.14 | 2.27 | 2.23 | 2.24 | | |
| Steers: Av. type sc. | | | | | | |
| Steers: Av. cond. sc. | 10.66 | 10.59 | 10.70 | 10.84 | | |
| Steers: Av. inbreeding | | | | | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

Station-owned

| 2 - Feed regime | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | | | Full-fed concentrate ration |
| Pounds/day over feeding period | | | 18.6 lbs./head/day |

Ration:
(a) Sires used: Angus, Brahman, Brangus, Charolais, Hereford, and Shorthorn
(b) Dams used: Straightbreds - Angus, Brahman, Brangus, and Hereford
Single crosses - A-B, A-BA, A-H; B-A, B-BA, B-H; BA-A, BA-B, BA-H; H-A, H-B, H-BA; C-A C-B, C-BA, C-H; and S-A, S-B, S-BA, S-H.

[Pelletized ration, 3/8" pellets]
2 parts steel-cut y. corn
1 1/2 part cr. oats
1 part wheat bran
1 1/2 part CSM
1 part dehy. alfalfa leaf meal

(c) Av. init. age = weaning age + 57 days; limited fed conc. ration listed above + hay free choice for this 57-day period.

FORM III
SLAUGHTER DATA, 1963

Louisiana State

| Location | Baton Rouge | Baton Rouge | Baton Rouge | Baton Rouge | Baton Rouge | Baton Rouge |
|---|---|---|---|---|---|---|
| Breed of sire | Charolais 037 | Charolais 096 | Hereford 72 | Hereford 801 | Shorthorn 158 | Shorthorn W-2 |
| Breed of dam | (a) | (a) | (a) | (a) | (a) | (a) |
| Line or group | (b) | (b) | (b) | (b) | (b) | (b) |
| Sex | Male | Male | Male | Male | Male | Male |
| Age at slaughter | 428 | 413 | 431 | 427 | 425 | 443 |
| No. slaughtered | 4 | 3 | 9 | 9 | 9 | 9 |
| Days in feedlot | 168 | 168 | 168 | 168 | 168 | 168 |
| Final feed-lot weight | 977.5 | 916.7 | 891.7 | 860.0 | 901.1 | 843.9 |
| Slaughter wt., live | 977.5 | 916.7 | 891.7 | 860.0 | 901.1 | 843.9 |
| Carcass wt. cold | 585.0 | 551.7 | 546.4 | 513.1 | 566.3 | 523.8 |
| Dressing per-cent, cold | 59.90 | 60.19 | 61.14 | 59.55 | 62.80 | 62.01 |
| Carcass grade, quality | 11.5 | 11.0 | 11.6 | 10.7 | 13.3 | 11.8 |
| Carcass grade, cutability | 3.6 | 3.6 | 4.3 | 4.0 | 4.2 | 4.3 |
| Est. percent kidney fat | 3.2 | 3.0 | 3.2 | 2.9 | 3.3 | 3.4 |
| Rib-eye area/100 lbs.car.(sq.in.) | 1.72 | 1.73 | 1.68 | 1.74 | 1.68 | 1.73 |
| Marbling score, USDA | 9.8 | 9.0 | 9.9 | 8.9 | 12.2 | 10.0 |
| Fat thickness over ribeye(in.)[1] | 0.83 | 0.80 | 1.04 | 0.93 | 0.97 | 0.99 |
| W-B shear force, lbs.[2] | 31.60 | 23.96 | 21.91 | 26.22 | 24.19 | 22.76 |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

One-inch core, cooked in deep fat

(a) Dams used: Straightbreds - Angus, Brahman, Brangus, and Hereford
Single crosses - A-B, A-BA, A-H; B-A, B-BA, B-H; BA-A, BA-B, BA-H; H-A, H-B, H-BA; C-A, C-B, C-BA, C-H; and S-A, S-B, S-BA, S-H.

(b) Straightbreds, single crosses, backcrosses, and three-breed crosses.

FORM III
SLAUGHTER DATA, 1963

Louisiana State

| Location | BatonRouge | BatonRouge | BatonRouge | BatonRouge | BatonRouge | BatonRouge |
|---|---|---|---|---|---|---|
| Breed of sire | Angus 333 | Angus 660 | Brahman 411 | Brahman 1258 | Brangus 787 | Brangus 666 |
| Breed of dam | (a) | (a) | (a) | (a) | (a) | (a) |
| Line or group | (b) | (b) | (b) | (b) | (b) | (b) |
| Sex | Male | Male | Male | Male | Male | Male |
| Age at slaughter | 436 | 429 | 424 | 432 | 430 | 439 |
| No. slaughtered | 10 | 7 | 12 | 9 | 14 | 16 |
| Days in feedlot | 168 | 168 | 168 | 168 | 168 | 168 |
| Final feedlot weight | 903.5 | 840.0 | 842.5 | 976.7 | 931.8 | 874.4 |
| Slaughter wt., live | 903.5 | 840.0 | 842.5 | 976.7 | 931.8 | 874.4 |
| Carcass weight, cold | 559.5 | 511.4 | 513.7 | 602.4 | 551.9 | 511.8 |
| Dressing percent, cold | 61.91 | 60.83 | 60.88 | 61.59 | 59.28 | 58.47 |
| Carcass grade, quality | 12.0 | 12.9 | 10.0 | 10.8 | 11.0 | 11.9 |
| Carcass grade, cutability | 3.6 | 4.4 | 3.6 | 4.1 | 3.4 | 3.8 |
| Est. percent kidney fat | 3.4 | 3.3 | 3.3 | 3.0 | 3.1 | 3.4 |
| Rib-eye area/100 lbs.carc.(sq.in.) | 1.86 | 1.67 | 1.72 | 1.54 | 1.87 | 1.78 |
| Marbling score, USDA | 11.1 | 11.1 | 6.2 | 8.3 | 8.3 | 10.2 |
| Fat thickness over ribeye(in.)[1] | 0.91 | 1.06 | 0.80 | 0.99 | 0.87 | 0.93 |
| W-B shear force, lbs.[2] | 22.31 | 19.78 | 22.33 | 27.63 | 29.44 | 25.95 |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

Meat cooked in deep fat; one-inch core.

(a) Dams used: Straightbreds - Angus, Brahman, Brangus, and Hereford
Single crosses - A-B, A-BA, A-H; B-A, B-BA, B-H; BA-A, BA-B, BA-H; H-A, H-B, H-BA; C-A, C-B, C-BA, C-H; and S-A, S-B, S-BA, S-H.

(b) Straightbreds, single crosses, backcrosses, and three-breed crosses.

FORM III
SLAUGHTER DATA, 1963

Louisiana State

| Location | BatonRouge | BatonRouge | BatonRouge | BatonRouge | | |
|---|---|---|---|---|---|---|
| Breed of sire | (a) | (a) | (a) | (a) | | |
| Breed of dam | (b) | (b) | (b) | (b) | | |
| Line or group | Straight-bred | Single crosses | Back-crosses | 3-breed crosses | | |
| Sex | Male | Male | Male | Male | | |
| Age at slaughter | 424 | 376 | 377 | 374 | | |
| No. slaughtered | 15 | 33 | 33 | 30 | | |
| Days in feedlot | 168 | 168 | 168 | 168 | | |
| Final feedlot weight | 821.3 | 872.1 | 915.0 | 922.8 | | |
| Slaughter wt., live | 821.3 | 872.1 | 915.0 | 922.8 | | |
| Carcass weight cold | 490.3 | 525.7 | 556.1 | 565.5 | | |
| Dressing per-cent, cold | 59.67 | 60.24 | 60.73 | 61.27 | | |
| Carcass grade, quality | 11.4 | 11.6 | 11.3 | 11.7 | | |
| Carcass grade, cutability | 3.6 | 3.8 | 4.0 | 4.0 | | |
| Est. percent, kidney fat | 3.1 | 3.3 | 3.2 | 3.3 | | |
| Rib-eye area/100 lbs. car.(sq.in.) | 1.81 | 1.80 | 1.63 | 1.69 | | |
| Marbling score, USDA | 9.4 | 9.6 | 8.9 | 10.0 | | |
| Fat thickness over ribeye(in.)[1] | 0.85 | 0.90 | 0.97 | 0.96 | | |
| W-B shear force, lbs.[2] | 24.79 | 24.38 | 26.03 | 23.82 | | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

One-inch core; cooked in deep fat.

(a) Sires used: Angus, Brahman, Brangus, Charolais, Hereford, and Shorthorn

(b) Dams used: Straightbreds - Angus, Brahman, Brangus, and Hereford
Single crosses - A-B, A-BA, A-H; B-A, B-BA, B-H; BA-A, BA-B, BA-H; H-A, H-B, H-BA; C-A, C-B, C-BA, C-H; and S-A, S-B, S-BA, S-H.

IBERIA LIVESTOCK EXPERIMENT STATION
Jeanerette, Louisiana

I. PROJECT: AHRD Line Project d1-6

Development of Pure and Crossbred Types of Beef Cattle for the Southeastern United States and the Gulf Coast Region

II. OBJECTIVES:

To compare and assess the performance of the Brahman-Angus, Africander-Angus, Angus, and Brahman for beef.

To study and evaluate carcass merit and meat quality of steers from the crossbred lines, purebreds, and other crosses.

To assess the progress made with the Brahman-Angus by comparing them to the first crosses of the two parent breeds.

To evaluate the combining ability of Angus and Brahman bulls when mated to samples of Brahman-Angus and Africander-Angus cows by measuring the growth and carcass merit of the progeny.

To study fertility among the several breed groups under normal management procedures on the station.

III. PERSONNEL:

T. M. DeRouen, W. L. Reynolds, J. W. High, Jr., A. M. Mullins, R. M. Boulware, Noah England, R. S. Temple, and E. J. Warwick

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of work.

The breeding studies have been continued and data have been collected on the various aspects of the project. Fertility investigations have been expanded to include studies on postweaning performance of cull cows in the fall. Cow production information has been examined in an effort to evaluate factors affecting the performance of the various breed groups. The steers have been fed by breed groups in order to calculate feed efficiency. Detailed carcass data were obtained on progeny of the several breed groups.

2. Research results.

a. Breeding season and conception. A total of 255 cows were sorted into 14 single-sire herds for breeding on pasture on April 15. The bulls,

which were tested for semen quality just prior to breeding, remained in the cow herd for 75 days. The brisket of each bull was painted with pigmented grease every day so that a record of heat could be obtained on every cow in the breeding herd.

All cows exposed to bulls during the breeding season were rectally palpated for pregnancy during late August and early September. Conception rates for 1962 for the various breeds of cows were: Angus, 87 percent; Brahman, 65 percent; Brahman-Angus, 63 percent; Africander-Angus, 72 percent; and first-cross (Angus x Brahman and Brahman x Angus), 100 percent. Numbers were small for the first-cross females. The over-all conception rate was 72 percent.

b. Calving and weaning performance. Calving began on January 15, 1963, and the last calf was born on April 20. Calving losses, which amounted to 7 percent during the 1963 season, were lower than normal for the station. The losses, shown in table 1, represent only those calves which died during the first 72 hours following parturition. No creep feed was given to the calves.

TABLE 1. Calving Report for 1963

| Breed of cow | Born | | Total | Percent live |
|---|---|---|---|---|
| | Live | Dead | | |
| Brahman-Angus | 57 | 6 | 63 | 90 |
| Africander-Angus | 33 | 0 | 33 | 100 |
| Angus | 34 | 3 | 37 | 92 |
| Brahman | 19 | 3 | 22 | 86 |
| First-cross | 18 | 0 | 18 | 100 |
| Totals | 161 | 12 | 173 | 93 |

c. Postweaning performance. Bull calves were selected at weaning and were indexed on the basis of growth and conformation, with equal emphasis given to each trait. The selected calves were placed in the gain-evaluation test for 140 days, and each animal was fed in an individual pen. Feed efficiency of the bulls by breed group, in 1963, was: Brahman-Angus, 6.84 pounds of feed per pound of gain; Brahman, 7.05 pounds; Angus, 7.39 pounds; and Africander-Angus, 7.40 pounds.

Results of the postweaning performance of the steer progeny indicated that first-cross steers and Brahman-Angus steers had essentially the same slaughter grade and Brahman steers had the lowest slaughter grade. The first-cross steers received a slaughter grade of 10.5, and were second to the Angus. Progeny sired by Angus bulls from the combining ability study gained faster on feed in dry-lot and achieved a higher slaughter score than similar animals sired by Brahman bulls.

d. Carcass data. In the last two years, the Federal graders expressed opinions that the lean of Brahman carcasses appeared high in moisture and somewhat like veal, yet the animals slaughtered were approximately 14 months

old. Angus steers continued to show superiority of carcasses, as indicated by grade, while the Brahman steers produced carcasses with the lowest grade. Brahman-Angus steers yielded carcasses that were considerably better than those of past years. Africander-Angus steer carcasses graded high-good, one-third of a grade less than the Angus carcasses. Tenderness scores disclosed the same pattern as in previous years - lean from Angus and Africander-Angus steers was most tender, while the Brahman was least tender.

e. Postweaning breeding performance of cows. A bull was placed with 11 open lactating cows on August 30, 1963. The calves were weaned 32 days later and the bulls kept with the cows for another 42 days. Twenty-five days later the cows were slaughtered. Two cows failed to come into heat while nursing a calf. Only 33 percent of the cows showing heat conceived. One cow still did not show heat after the calves were weaned. Forty-three percent of the cows bred after the calves were removed were pregnant within the 33 days. Cows in medium to good flesh had an 83 percent pregnancy rate for the entire 66-day period, compared to a 20 percent pregnancy rate for cows in thin flesh.

3. Improvement of facilities.

A portion of the marsh was cleared, crowned, and drained. One residence was moved from near the bayou to the Annex. This house was completely renovated and put in good condition. It is planned to put a herdsman in this house. Backscratchers were installed in all pastures and charged with an insecticide for controlling external parasites.

FUTURE PLANS:

1. Old projects.

The present breeding project will be terminated in early 1964 when the carcass data on the steers is obtained.

2. New Projects:

a. A genetic-environmental interaction study will be integrated with the reproduction-physiology investigation. This project has been proposed and approved. Two divergent breeds - Angus and Brahman - and the crosses will be used in the study.

b. An investigation of selection for changes in meatiness of Brahman-Angus and Angus cattle has been proposed. The objective of the study is to determine if changes in meatiness of Angus and Brahman-Angus can be made by selection in opposite directions for fatness, as measured by ultrasonics.

c. A study of the response of selection for adaptability in the Gulf Coast area using Angus cattle has been designed and submitted.

3. Improvements.

The remaining marsh land will be cleared, crowned, drained, and seeded to suitable forages for cattle. Additional fences and cross-fences will be constructed for better utilization of pastures. Drainage will be improved where needed. Existing residences and barns will be repaired. A new set of scales and chutes is planned for installation at the head-quarters.

VI. PUBLICATIONS DURING THE YEAR:

DeRouen, T. M., W. L. Reynolds, and J. W. High, Jr. 1963. Evaluation of the Sindhi breed for beef at the Iberia station. J. Animal Sci. 22:43 (abs.).

DeRouen, T. M., W. L. Reynolds, J. W. High, Jr., R. S. Temple, and Noah England. 1963. Third Livestock Producers' Day Report. Animal Science Department, Louisiana State University, pp. 49-54.

Reynolds, W. L., T. M. DeRouen, and J. W. High, Jr. 1963. The age and weight at puberty of Angus, Brahman, and zebu-cross heifers. J. Animal Sci. 22:243 (abs.).

Reynolds, W. L., T. M. DeRouen, and J. W. High, Jr. 1963. The effect of growth rate on calving percent of Brangus and Africander-Angus heifers. J. Animal Sci. 22:821 (abs.).

Wiltbank, J. N., and W. R. Harvey. 1963. Reproductive performance of beef cows in Louisiana. J. Animal Sci. 22:823 (abs.).

VII. PUBLICATIONS PLANNED:

A study of the combining ability of Angus and Brahman bulls with Brahman-Angus and Africander-Angus cows.

A review of the old breeding project.

Evaluation of the R. O. P. bull test.

A study of shrink in cattle.

Submitted by: T. M. DeRouen

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Louisiana, Jeanerette State

| Location | Jeanerette | Jeanerette | Jeanerette | Jeanerette | Jeanerette | Jeanerette |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Brahman | Angus | Brahman | B-A | Brahman |
| Breed of dam | B-A | B-A | Af-A | Af-A | B-A | Brahman |
| Line or group[1] | Combining ability | Combining ability | Combining ability | Combining ability | Brahman-Angus | Purebred |
| No. cows exposed[2] | 19 | 18 | 10 | 9 | 68 | 24 |
| No. calves born[3] | 10 | 10 | 8 | 4 | 43 | 14 |
| Calving percent, born | 53 | 56 | 80 | 44 | 63 | 58 |
| Av. birth date | 3-01-63 | 3-08-63 | 2-05-63 | 2-21-63 | 2-14-63 | 2-26-63 |
| Av. birth wt. | 66 | 79 | 63 | 81 | 62 | 65 |
| No. calves weaned | 10 | 10 | 8 | 4 | 36 | 11 |
| Calving percent weaned[4] | 53 | 56 | 80 | 44 | 53 | 46 |
| Av. weaning age, days | 192 | 185 | 216 | 200 | 207 | 195 |
| Adj. ADG[5] | 1.62 | 1.81 | 1.45 | 1.73 | 1.66 | 1.64 |
| Av. type sc.[6] | 9.6[a] | 8.8[a] | 11.0[a] | 9.3[a] | 9.5[a] | 9.2[a] |
| Av. cond. sc.[6] | 8.2[a] | 8.2[a] | 8.9[a] | 8.8[a] | 8.0[a] | 8.1[a] |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

Sex of calf, age of dam, 205 day basis (to a steer basis).

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

[a]Scored by five men.

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Louisiana, Jeanerette State

| Location | Jeanerette | Jeanerette | Jeanerette | Jeanerette | Jeanerette | |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Afr-Ang | Brahman | Angus | B-A | |
| Breed of dam | Angus | Afr-Ang | Angus | Brahman | (AxB-BxA) $F_1$ | |
| Line or group[1] | Purebred | Afr-Ang | Crossbred | Crossbred | BA $F_1$ | |
| No. cows exposed[2] | 32 | 32 | 14 | 10 | 18 | |
| No. calves born[3] | 27 | 21 | 10 | 8 | 18 | |
| Calving percent, born | 84 | 66 | 71 | 80 | 100 | |
| Av. birth date | 2-04-63 | 2-17-63 | 2-08-63 | 2-28-63 | 2-19-63 | |
| Av. birth wt. | 59 | 71 | 74 | 66 | 69 | |
| No. calves weaned | 24 | 21 | 10 | 8 | 18 | |
| Calving percent, weaned[4] | 75 | 66 | 71 | 80 | 100 | |
| Av. weaning age, days | 217 | 204 | 213 | 193 | 202 | |
| Adj. ADG[5] | 1.34 | 1.47 | 1.80 | 1.74 | 1.84 | |
| Av. type sc.[6] | 10.8[a] | 8.0[a] | 10.8[a] | 10.1[a] | 11.0[a] | |
| Av. cond. sc.[6] | 8.4[a] | 6.5[a] | 9.6[a] | 9.9[a] | 9.7[a] | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

Sex of calf, age of dam, 205 day basis to a steer basis.

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

[a]Scored by five men.

# FORM II
# POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Louisiana, Jeanerette State

| | Location | Jeanerette | Jeanerette | Jeanerette | Jeanerette | Jeanerette | Jeanerette |
|---|---|---|---|---|---|---|---|
| | Breed of sire | B-A | Angus | Brahman | Afr-Ang | Angus | Angus |
| | Breed of dam | B-A | Angus | Brahman | Afr-Ang | Afr-Ang | Brahman |
| | Line or group[1] | B-A | Purebred | Purebred | Afr-Ang | Comb.Ab. | Crossbred |
| Bulls | No. in group | 11 | 6 | 3 | 3 | | |
| | Av. init. age[a] | 214 | 228 | 216 | 210 | | |
| | Av. init. wt. | 430 | 405 | 413 | 395 | | |
| | Av.no.da.fed | 140 | 140 | 140 | 140 | | |
| | Av. final wt. | 799 | 782 | 702 | 747 | | |
| | ADG on test | 2.64 | 2.70 | 2.06 | 2.51 | | |
| | Av. type sc. | 9.5 | 11.6 | 8.9 | 10.1 | | |
| | Av. cond. sc. | 8.7 | 10.4 | 8.1 | 9.1 | | |
| | Av. inbreeding | 12.32 | none | none | 12.61 | | |
| Heifers | No. in group | | | | | 2 | |
| | Av. init. age[a] | | | | | 240 | |
| | Av. init. wt. | | | | | 345 | |
| | Av.no.da.fed | | | | | 168 | |
| | Av. final wt. | | | | | 688 | |
| | ADG on test | | | | | 2.04 | |
| | Av. type sc. | | | | | 10.0 | |
| | Av. cond. sc. | | | | | 10.3 | |
| | Av. inbreeding | | | | | none | |
| Steers | No. in group | 20 | 11 | 6 | 13 | 6 | 5 |
| | Av. init. age[a] | 236 | 251 | 197 | 238 | 243 | 250 |
| | Av. init. wt. | 382 | 344 | 325 | 355 | 373 | 511 |
| | Av.no.da.fed | 182 | 182 | 182 | 182 | 182 | 182 |
| | Av. final wt. | 797 | 731 | 666 | 727 | 786 | 937 |
| | ADG on test | 2.29 | 2.13 | 1.87 | 2.04 | 2.27 | 2.34 |
| | Av. type sc. | 9.1 | 11.4 | 8.7 | 9.0 | 10.8 | 10.2 |
| | Av. cond. sc. | 9.5 | 11.4 | 8.5 | 9.4 | 10.9 | 10.5 |
| | Av. inbreeding | 10.0 | none | none | 16.98 | none | none |

1 - Show whether station or cooperator owned, in addition to other group designation.
All cattle owned by Louisiana Agricultural Experiment Station.

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | Full-fed | Full-fed | Full-fed |
| Pounds/day over feeding period | 17.56 | 18.86 | 19.82 |
| Ration | -All cattle fed the same ration- | | |
| | 500 lbs. corn chops | | Chemical Analysis |
| | 100 lbs. CSM (41% protein grade) | | 11.3% protein |
| | 100 lbs. molasses | | 3.5% fat |
| | 50 lbs. alfalfa meal | | 11.6% fibre |
| | 249 lbs. cottonseed hulls | | 13.5% HOH |
| | 1 lb. oyster shell flour | | 56.2% N.F.E. |
| | 0.5 lb. Vit. A conc./1000 lbs. of feed | | 3.9% Ash |
| | | | 2033 Vit. A units/lb. |

[a]Initial age: weaning age + 14 days, bulls; weaning age + 30 days, heifers; weaning age + 27 days, steers.

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Louisiana, Jeanerette State

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Location | | Jeanerette | Jeanerette | Jeanerette | Jeanerette | | |
| Breed of sire | | B-A | Angus | Brahman | Brahman | | |
| Breed of dam | | F1 | B-A | B-A | Afr.-Angus | | |
| Line or group[1] | | BA x F1 | Comb.Ab. | Comb.Ab. | Comb.Ab. | | |
| Bulls | No. in group | | | | | | |
| | Av. init. age | | | | | | |
| | Av. init. wt. | | | | | | |
| | Av.no.da.fed | | | | | | |
| | Av. final wt. | | | | | | |
| | ADG on test | | | | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | | | | | | |
| | Av. inbreeding | | | | | | |
| Heifers | No. in group | 5 | 3 | 5 | 5 | | |
| | Av. init. age | 246 | 270 | 233 | 230 | | |
| | Av. init. wt. | 448 | 425 | 423 | 359 | | |
| | Av.no.da.fed | 168 | 168 | 168 | 168 | | |
| | Av. final wt. | 786 | 785 | 748 | 693 | | |
| | ADG on test | 2.01 | 2.14 | 1.93 | 1.99 | | |
| | Av. type sc. | 10.6 | 9.8 | 7.9 | 8.0 | | |
| | Av. cond. sc. | 9.7 | 9.2 | 8.6 | 9.1 | | |
| | Av. inbreeding | none | none | none | none | | |
| Steers | No. in group | 3 | 9 | 6 | 3 | | |
| | Av. init. age | 234 | 247 | 199 | 188 | | |
| | Av. init. wt. | 423 | 428 | 417 | 388 | | |
| | Av.no.da.fed | 182 | 182 | 182 | 182 | | |
| | Av. final wt. | 872 | 828 | 771 | 798 | | |
| | ADG on test | 2.46 | 2.20 | 1.95 | 2.25 | | |
| | Av. type sc. | 9.5 | 10.3 | 7.4 | 8.9 | | |
| | Av. cond. sc. | 10.1 | 10.9 | 8.0 | 9.7 | | |
| | Av. inbreeding | none | none | none | none | | |

1 - Show whether station or cooperator owned, in addition to other group designation.
All cattle owned by the Louisiana Agricultural Experiment Station.

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | Full-fed | Full-fed | Full-fed |
| Pounds/day over feeding period | | | |
| Ration: | All cattle fed the same ration.<br>500 lbs. corn chops<br>100 lbs. CSM (41% protein grade)<br>100 lbs. molasses<br>50 lbs. alfalfa meal<br>249 lbs. cottonseed hulls<br>1 lb. oyster shell flour<br>0.5 lb. Vit. A conc./1000 lbs. of feed | | Chemical Analysis<br>11.3% protein<br>3.5% fat<br>11.6% fiber<br>13.5% HOH<br>56.2% N.F.E.<br>3.9% Ash<br>2033 Vit. A units/lb. |

FORM III
SLAUGHTER DATA, 1963

Louisiana, Jeanerette State

| Location | Jeanerette | Jeanerette | Jeanerette | Jeanerette | Jeanerette | Jeanerette |
|---|---|---|---|---|---|---|
| Breed of sire | B-A | Afr-Ang | Angus | Brahman | Angus | B-A |
| Breed of dam | B-A | Afr-Ang | Angus | Brahman | Brahman | $F_1$ |
| Line or group | B-A | Afr-Ang | Purebred | Purebred | Crossbred | BA x $F_1$ |
| Sex | Steer | Steer | Steer | Steer | Steer | Steer |
| Age at slaughter | 419 | 413 | 435 | 381 | 434 | 418 |
| No. slaughtered | 20 | 13 | 11 | 6 | 5 | 3 |
| Days in feedlot | 182 | 182 | 182 | 182 | 182 | 182 |
| Final feedlot weight | 797 | 727 | 731 | 666 | 937 | 872 |
| Slaughter weight, live | 778 | 705 | 716 | 646 | 915 | 835 |
| Carcass wt., cold | 467 | 419 | 431 | 379 | 562 | 491 |
| Dressing percent, cold(a) | 60.02 | 59.36 | 60.24 | 58.58 | 61.50 | 58.87 |
| Carcass grade, quality (b) | 11.6 | 11.0 | 12.0 | 8.0 | 11.0 | 11.0 |
| Carcass grade, cutability(b) | 3.0 | 2.7 | 3.2 | 2.6 | 3.8 | 3.6 |
| Est. percent kidney fat(b) | 3.2 | 2.8 | 3.0 | 2.1 | 3.2 | 3.8 |
| Rib-eye area/100 lbs.carc.(sq.in.) | 2.09 | 2.16 | 2.10 | 2.07 | 1.73 | 1.79 |
| Marbling score, USDA | 11.7 | 12.0 | 12.0 | 4.0 | 9.0 | 10.0 |
| Fat thickness over ribeye(in.)[1] | 0.54 | 0.35 | 0.62 | 0.35 | 0.72 | 0.69 |
| W-B shear force, lbs.[2] | 26.25 | 22.30 | 23.27 | 27.22 | 24.38 | 24.76 |

1 - Use one measure; if not, indicate method.

Measure taken at three points and averaged.

2 - Indicate size of core used and how meat was cooked

Core size = 1 inch; cooked in deep fat

[a]Dressing percent based on slaughter weight obtained just before slaughter.
[b]Estimated by Federal grader.

FORM III
SLAUGHTER DATA, 1963

Louisiana, Jeanerette State

| Location | Jeanerette | Jeanerette | Jeanerette | Jeanerette | | |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Brahman | Angus | Brahman | | |
| Breed of dam | Afr-Ang | Afr-Ang | B-A | B-A | | |
| Line or group | Comb. Ab. | Comb. Ab. | Comb.Ab. | Comb.Ab. | | |
| Sex | Steer | Steer | Steer | Steer | | |
| Age at slaughter | 428 | 399 | 431 | 410 | | |
| No. slaughtered | 6 | 3 | 9 | 6 | | |
| Days in feedlot | 182 | 182 | 182 | 182 | | |
| Final feedlot weight | 786 | 798 | 828 | 771 | | |
| Slaughter wt., live | 771 | 775 | 798 | 750 | | |
| Carcass wt., cold | 465 | 478 | 486 | 447 | | |
| Dressing percent, cold | 60.31 | 61.68 | 60.77 | 59.60 | | |
| Carcass grade, quality | 12.0 | 12.3 | 12.0 | 9.5 | | |
| Carcass grade, cutability | 3.3 | 3.2 | 3.4 | 2.6 | | |
| Est. percent kidney fat | 3.0 | 2.8 | 2.9 | 3.0 | | |
| Rib-eye area/100 lbs.car.(sq.in.) | 2.07 | 1.87 | 1.95 | 2.12 | | |
| Marbling score, USDA | 12.0 | 14.3 | 13.0 | 7.2 | | |
| Fat thickness over ribeye(in.)[1] | 0.72 | 0.58 | 0.68 | 0.46 | | |
| W-B shear force, lbs.[2] | 20.39 | 29.73 | 20.48 | 24.24 | | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

One-inch core; cooked in deep fat

FORM III
SLAUGHTER DATA, 1963

Jeanerette, Louisiana State

| Location | Jeanerette | Jeanerette | Jeanerette | Jeanerette | Jeanerette | |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Brahman | Angus | Brahman | B-A | |
| Breed of dam | Afr-Ang | Afr-Ang | B-A | B-A | $F_1$ | |
| Line or group | Comb.Ab. | Comb.Ab. | Comb.Ab. | Comb.Ab. | Comb.Ab. | |
| Sex | Heifers | Heifers | Heifers | Heifers | Heifers | |
| Age at slaughter | 408 | 398 | 438 | 401 | 414 | |
| No. slaughtered | 2 | 5 | 3 | 5 | 5 | |
| Days in feedlot | 168 | 168 | 168 | 168 | 168 | |
| Final feedlot weight | 688 | 693 | 785 | 748 | 786 | |
| Slaughter wt., live | 675 | 654 | 768 | 730 | 766 | |
| Carcass wt., cold | 418 | 414 | 466 | 448 | 465 | |
| Dressing percent, cold | 61.77 | 61.15 | 60.68 | 61.41 | 60.72 | |
| Carcass grade, quality | 12.0 | 12.0 | 13.0 | 12.0 | 9.4 | |
| Carcass grade, cutability | 3.6 | 3.2 | 4.0 | 3.6 | 3.8 | |
| Est. percent kidney fat | 4.2 | 4.1 | 4.2 | 3.8 | 4.1 | |
| Rib-eye area/100 lbs. car.(sq.in.) | 2.21 | 2.14 | 1.94 | 2.03 | 2.00 | |
| Marbling score, USDA | 11.0 | 13.0 | 14.0 | 12.0 | 7.0 | |
| Fat thickness over ribeye(in.)[1] | 0.63 | 0.50 | 0.66 | 0.62 | 0.57 | |
| W-B shear force, lbs.[2] | 22.37 | 26.05 | 28.93 | 27.85 | 26.67 | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

MISSISSIPPI STATE UNIVERSITY
Agricultural Experiment Station

I. PROJECT: Hatch 666 (S-10)

A Study to Determine the Breeding Worth of Inbred and Outbred Bulls from Various Sources.

II. OBJECTIVES:

To compare pre- and postweaning growth rates, market grades, carcass qualities, carcass grades, and maternal ability of the progenies of potentially superior sires selected from various sources.

III. PERSONNEL:

C. J. Christians, W. A. Pund, and C. E. Lindley

IV. ACCOMPLISHMENTS DURING THE YEAR:

Weights and grades were collected at weaning on 122 Hereford calves from eight bull units, 83 Angus calves from four bull units, and 27 Shorthorn calves from two bull units. Average daily gains from birth to weaning - adjusted for sex and age of dam - and grades were as follows for each Hereford unit: VA 0188, 1.65 and 10.5; VA 0187, 1.59 and 10.1; Jones 051, 1.59 and 10.3; Jones 038, 1.70 and 10.0; Rankin 737, 1.58 and 11.8; Colorado 6082, 1.66 and 10.4; Colorado 9022, 1.75 and 9.4; and New Mexico 3, 1.70 and 10.8. Gains and grades for Angus units were VA 0038, 1.79 and 11.3; Auburn 762, 1.84 and 11.3; Woodruff 220, 1.77 and 11.6; and Hawkeye 9P18, 1.82 and 10.6. Gains and grades of the two Shorthorn units were: Valley View VF4, 1.79 and 10.8; and Goodnews 56-66, 1.53 and 10.4.

The first five steer calves born from eight Hereford and four Angus bulls were fed on a 198-day feeding test. Detailed carcass and palatability measurements were taken, and some of the results are shown in table 1.

TABLE 1. Carcass Data

| Sire group | ADG | Carc. grade | Dress. percent | Yield grade | Lngth. carc. | Lngth. leg | Cir. round | Loin eye area | Shear value |
|---|---|---|---|---|---|---|---|---|---|
| Hereford | | | | | | | | | |
| Rankin 910 | 1.57 | 8.0 | 56.1 | 2.2 | 43.1 | 27.6 | 28.4 | 9.3 | 23.3 |
| Rankin 9011 | 1.58 | 8.6 | 58.0 | 2.0 | 42.9 | 27.1 | 28.3 | 9.7 | 25.3 |
| Jones 038 | 1.79 | 8.6 | 57.6 | 2.2 | 45.4 | 28.4 | 29.2 | 10.4 | 22.9 |
| Va. 0188 | 1.65 | 9.4 | 57.8 | 2.4 | 44.3 | 27.9 | 29.2 | 10.6 | 20.4 |
| Ga. 692 | 2.09 | 9.8 | 57.6 | 2.6 | 46.2 | 29.3 | 30.3 | 10.0 | 20.1 |

TABLE 1. Continued

| Sire grade | ADG | Carc. grade | Dress. percent | Yield grade | Lngth. carc. | Lngth. leg | Cir. round | Loin eye area | Shear value |
|---|---|---|---|---|---|---|---|---|---|
| Rankin 839 | 1.56 | 8.8 | 59.7 | 1.9 | 43.7 | 27.8 | 29.3 | 10.3 | 20.6 |
| Va. D187 | 1.66 | 8.4 | 57.6 | 2.0 | 43.2 | 27.5 | 28.3 | 9.8 | 21.6 |
| Colo. 8170 | 1.84 | 10.4 | 59.2 | 2.4 | 45.1 | 28.5 | 29.6 | 9.9 | 21.1 |
| Angus | | | | | | | | | |
| Va. 9249 | 1.61 | 10.8 | 58.8 | 2.6 | 43.3 | 27.6 | 28.4 | 10.7 | 23.7 |
| Va. 0038 | 1.72 | 11.0 | 59.5 | 2.8 | 44.2 | 27.6 | 29.5 | 9.9 | 21.7 |
| Okla. 066 | 1.62 | 11.0 | 58.8 | 3.2 | 44.1 | 27.1 | 28.7 | 10.5 | 21.9 |
| Okla. 436 | 1.73 | 11.2 | 58.9 | 2.6 | 45.0 | 27.6 | 29.0 | 10.7 | 18.8 |

Results of data indicate differences between sire lines are sufficiently great to base their selection on weights, grade, and carcass traits.

V. FUTURE PLANS:

The testing of various lines and the collection of data on their progeny will be continued.

VI. PUBLICATIONS DURING THE YEAR:

Christians, C. J., J. C. Taylor, C. E. Lindley, and W. A. Pund. 1964. The effect of selecting sires from inbred and outbred lines of beef cattle on reproductive performance. Mississippi Annual Livestock Field Day Report.

Christians, C. J., J. C. Taylor, C. E. Lindley, and W. A. Pund. 1964. Better results with linebred bulls. Mississippi Farm Research, Vol. 27, No. 6.

Hagan, Fay, C. E. Lindley, C. J. Christians, and J. C. Taylor. 1964. A study of economically important preweaning traits in beef cattle and herd bull selection. Mississippi Annual Livestock Field Day Report.

Hagan, Fay, J. C. Taylor, C. E. Lindley, and C. J. Christians. 1963. Heritability of weaning weights and grades in beef cattle. Mississippi Farm Research, Vol. 26, No. 11.

Taylor, J. C., L. F. Bowlin, W. A. Pund, H. W. Essig, and C. E. Lindley. 1963. Herd bull selection. Mississippi Farm Research, Vol. 26, No. 11.

VII. PUBLICATIONS PLANNED:

Master's Thesis on the effect of various mating systems on various carcass traits.

The effect of various mating systems on various production traits.

Submitted by: C. E. Lindley

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Mississippi State

| Location | Prairie | Prairie | Prairie | Prairie | Prairie | Prairie |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | Shorthorn | Shorthorn | Angus | Angus |
| Breed of dam | Hereford | Hereford | Shorthorn | Shorthorn | Angus | Angus |
| Line or group[1] | Colorado 9022 | New Mexico 3 | ValleyView VF-4 | Goodnews 56-66 | Virginia 0038 | Auburn 7C2 |
| No. cows exposed[2] | 30 | 22 | 20 | 21 | 25 | 32 |
| No. calves born[3] | 24 | 19 | 10 | 15 | 24 | 26 |
| Calving percent, born | 80.0 | 86.4 | 50.0 | 71.4 | 96.0 | 81.3 |
| Av. birth date | 3-22-63 | 3-21-63 | 3-28-63 | 3-20-63 | 2-28-63 | 3-09-63 |
| Av. birth wt. | 69.5 | 75.3 | 68.5 | 72.5 | 61.5 | 65.8 |
| No. calves weaned | 17 | 18 | 9 | 14 | 23 | 25 |
| Calving percent, weaned[4] | 56.7 | 81.8 | 45.0 | 66.7 | 92.0 | 78.1 |
| Av. weaning age, days | 202 | 203 | 196 | 204 | 224 | 215 |
| Adj. ADG[5] | 1.75 | 1.70 | 1.79 | 1.53 | 1.79 | 1.84 |
| Av. type sc.[6] | 9.4 | 10.8 | 10.8 | 10.4 | 11.3 | 11.3 |
| Av. cond. sc.[6] | | | | | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

Adjusted for sex and age of dam

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Mississippi State

| Location | Prairie | Prairie | Prairie | Prairie | Prairie | Prairie |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | Hereford | Hereford | Hereford | Hereford |
| Breed of dam | Hereford | Hereford | Hereford | Hereford | Hereford | Hereford |
| Line or group[1] | Va. 0188 | Va. Palmer 0187 | Jones 051 | Jones 038 | Rankin 737 | Colorado 6082 |
| No. cows exposed[2] | 18 | 17 | 21 | 22 | 28 | 24 |
| No. calves born[3] | 15 | 13 | 18 | 16 | 21 | 16 |
| Calving percent, born | 83.3 | 76.5 | 85.7 | 73.7 | 75.0 | 66.7 |
| Av. birth date | 3-18-63 | 3-13-63 | 3-14-63 | 4-01-63 | 3-30-63 | 3-06-63 |
| Av. birth wt. | 64.5 | 69.7 | 68.2 | 78.3 | 71.6 | 68.8 |
| No. calves weaned | 13 | 13 | 15 | 15 | 16 | 15 |
| Calving percent, weaned[4] | 72.2 | 76.5 | 68.2 | 68.2 | 57.1 | 62.5 |
| Av. weaning age, days | 206 | 211 | 210 | 192 | 194 | 218 |
| Adj. ADG[5] | 1.65 | 1.59 | 1.59 | 1.70 | 1.58 | 1.66 |
| Av. type sc.[6] | 10.5 | 10.1 | 10.3 | 10.0 | 11.8 | 10.4 |
| Av. cond. sc.[6] | | | | | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

Adjusted for sex and age of dam.

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Mississippi Angus

| Location | Prairie | Prairie | | | | |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Angus | | | | |
| Breed of dam | Angus | Angus | | | | |
| Line or group[1] | Woodruff 220[a] | Hawkeye 9P18[b] | | | | |
| No. cows exposed[2] | 15 | 41 | | | | |
| No. calves born[3] | 6 | 29 | | | | |
| Calving percent, born | 40.0 | 70.7 | | | | |
| Av. birth date | 2-19-63 | 4-05-63 | | | | |
| Av. birth wt. | 56.7 | 64.4 | | | | |
| No. calves weaned | 6 | 29 | | | | |
| Calving percent, weaned[4] | 40.0 | 70.7 | | | | |
| Av. weaning age, days | 233 | 188 | | | | |
| Adj. ADG[5] | 1.77 | 1.82 | | | | |
| Av. type sc.[6] | 11.6 | 10.6 | | | | |
| Av. cond. sc. | | | | | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive,
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

Adjusted for sex and age of dam.

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

[a]Bred artificially.
[b]Bull removed from herd after 23 days of service due to torn sheath.

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Mississippi State

| | | | | | | |
|---|---|---|---|---|---|---|
| Location | Prairie | Prairie | Prairie | Prairie | Prairie | Prairie |
| Breed of sire | Hereford | Hereford | Hereford | Hereford | Hereford | P.Hereford |
| Breed of dam | Hereford | Hereford | Hereford | Hereford | Hereford | P.Hereford |
| Line or group[1] | Rankin910 | Rankin9011 | Rankin839 | Va.0188 | Va.0187 | Jones 038 |
| Bulls: No. in group | | | | | | |
| Bulls: Av. init. age | | | | | | |
| Bulls: Av. init. wt. | | | | | | |
| Bulls: Av.no.da.fed | | | | | | |
| Bulls: Av. final wt. | | | | | | |
| Bulls: ADG on test | | | | | | |
| Bulls: Av. type sc. | | | | | | |
| Bulls: Av. cond. sc. | | | | | | |
| Bulls: Av. inbreeding | | | | | | |
| Heifers: No. in group | | | | | | |
| Heifers: Av. init. age | | | | | | |
| Heifers: Av. init. wt. | | | | | | |
| Heifers: Av.no.da.fed | | | | | | |
| Heifers: Av. final wt. | | | | | | |
| Heifers: ADG on test | | | | | | |
| Heifers: Av. type sc. | | | | | | |
| Heifers: Av. cond. sc. | | | | | | |
| Heifers: Av. inbreeding | | | | | | |
| Steers: No. in group | 5 | 5 | 5 | 5 | 5 | 5 |
| Steers: Av. init. age[a] | 276 | 257 | 274 | 276 | 256 | 279 |
| Steers: Av. init. wt. | 412 | 399 | 441 | 434 | 413 | 455 |
| Steers: Av.no.da.fed | 198 | 198 | 198 | 198 | 198 | 198 |
| Steers: Av. final wt.[b] | 723 | 713 | 750 | 760 | 742 | 810 |
| Steers: ADG on test | 1.57 | 1.58 | 1.56 | 1.65 | 1.66 | 1.79 |
| Steers: Av. type sc. | 10.0 | 9.0 | 9.4 | 9.6 | 9.0 | 9.4 |
| Steers: Av. cond. sc. | | | | | | |
| Steers: Av. inbreeding | | | | | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

STATION OWNED

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. Pounds/day over feeding period | | | Full-fed |
| Ration:[c] | [12-6-62 to 2-1-63] | [2-2-63 to 5-9-63] | [5-10-63 to 6-21-63] |
| | 5.25 lbs. gr.ear corn | 10.5 lbs. gr.sh.corn | 15.4 lbs. gr.sh.corn |
| | 1.5 lbs. CSM | 1.5 lbs. CSM | 1.5 lbs. CSM |
| | 19.8 lbs. sorg. sil. | 20.1 lbs. sorg. sil. | 5.1 lbs. CS hulls |
| | 2.8 lbs. JG hay | 2.6 lbs. JG hay | 8.4 lbs. sorg. silage |
| | | | 2.1 lbs. JG hay |

[a]Calves were weaned on 11-1-62, steers were placed on test 12-6-62.
[b]Average of two weights on two consecutive days, shrunk overnight off feed.
[c]Given on the basis of pounds/steer/day.

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Mississippi State

| | | | | | | |
|---|---|---|---|---|---|---|
| Location | Prairie | Prairie | Prairie | Prairie | Prairie | Prairie |
| Breed of sire | P.Hereford | Hereford | Angus | Angus | Angus | Angus |
| Breed of dam | Hereford | Hereford | Angus | Angus | Angus | Angus |
| Line or group[1] | Ga.Poll.69 | Col.8170 | Va.9249 | Va.0038 | Okla.066 | Okla.436 |
| Bulls: No. in group | | | | | | |
| Bulls: Av. init. age | | | | | | |
| Bulls: Av. init. wt. | | | | | | |
| Bulls: Av.no.da.fed | | | | | | |
| Bulls: Av. final wt. | | | | | | |
| Bulls: ADG on test | | | | | | |
| Bulls: Av. type sc. | | | | | | |
| Bulls: Av. cond. sc. | | | | | | |
| Bulls: Av. inbreeding | | | | | | |
| Heifers: No. in group | | | | | | |
| Heifers: Av. init. age | | | | | | |
| Heifers: Av. init. wt. | | | | | | |
| Heifers: Av.no.da.fed | | | | | | |
| Heifers: Av. final wt. | | | | | | |
| Heifers: ADG on test | | | | | | |
| Heifers: Av. type sc. | | | | | | |
| Heifers: Av. cond. sc. | | | | | | |
| Heifers: Av. inbreeding | | | | | | |
| Steers: No. in group | 5 | 5 | 5 | 5 | 5 | 5 |
| Steers: Av. init. age[a] | 285 | 277 | 275 | 278 | 286 | 288 |
| Steers: Av. init. wt. | 472 | 450 | 468 | 487 | 476 | 500 |
| Steers: Av.no.da.fed | 198 | 198 | 198 | 198 | 198 | 198 |
| Steers: Av. final wt.[b] | 885 | 814 | 787 | 827 | 796 | 842 |
| Steers: ADG on test | 2.09 | 1.84 | 1.61 | 1.72 | 1.62 | 1.73 |
| Steers: Av. type sc. | 10.2 | 10.2 | 9.8 | 10.6 | 10.0 | 11.0 |
| Steers: Av. cond. sc. | | | | | | |
| Steers: Av. inbreeding | 0 | 0 | 0 | 0 | 0 | 0 |

1 - Show whether station or cooperator owned in addition to other group designation.

Station owned

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | | | Full-fed |
| Pounds/day over feeding period | | | |
| | [12-6-62 to 2-1-63] | [2-2-63 to 5-9-63] | [5-10-63 to 6-21-63] |
| Ration:[c] | 5.25 lbs. gr.ear corn | 10.5 lbs. gr.sn.corn | 15.4 lbs. gr.sn.corn |
| | 1.5 lbs. CSM | 1.5 lbs. CSM | 1.5 lbs. CSM |
| | 19.8 lbs. sorg. sil. | 20.1 lbs. sorg. sil. | 8.4 lbs. sorg. silage |
| | 2.8 lbs. J-G hay | 2.6 lbs. J-G hay | 5.1 lbs. CS hulls |
| | | | 2.1 lbs. J-G hay |

[a]Calves were weaned on 11-1-62, steers were placed on test 12-6-62.
[b]Average of two weights on two consecutive days, shrunk overnight off feed.
[c]Given on the basis on pounds/steer/day.

FORM III
SLAUGHTER DATA, 1963

Mississippi State

| Location | Prairie | Prairie | Prairie | Prairie | Prairie | Prairie |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | Hereford | Hereford | Hereford | Hereford |
| Breed of dam | Hereford | Hereford | Hereford | Hereford | Hereford | Hereford |
| Line or group | Rankin 910 | Rankin9011 | Rankin 839 | Va. 0188 | Va. 0187 | Jones 038 |
| Sex | Steer | Steer | Steer | Steer | Steer | Steer |
| Age at slaughter | 474 | 455 | 472 | 474 | 454 | 477 |
| No. slaughtered | 5 | 5 | 5 | 5 | 5 | 5 |
| Days in feedlot | 198 | 198 | 198 | 198 | 198 | 198 |
| Final feedlot weight | 723 | 713 | 750 | 760 | 742 | 810 |
| Slaughter weight, live | 723 | 713 | 750 | 760 | 742 | 810 |
| Carcass weight, cold[a] | 404 | 415 | 448 | 440 | 428 | 467 |
| Dressing percent, cold[a] | 56.1 | 58.1 | 59.8 | 57.8 | 57.6 | 57.6 |
| Carcass grade, quality[b] | 8.0 | 8.6 | 8.8 | 9.4 | 8.4 | 8.6 |
| Carcass grade, cutability[c] | 2.2 | 2.0 | 1.96 | 2.4 | 2.0 | 2.2 |
| Est. percent kidney fat | | | | | | |
| Rib-eye area/100 lbs.carc.(sq.in.) | 2.32 | 2.34 | 2.30 | 2.40 | 2.28 | 2.24 |
| Marbling score, USDA[d] | 10.8 | 10.4 | 10.4 | 10.0 | 10.6 | 10.4 |
| Fat thickness over ribeye(in.)[1] | 0.38 | 0.31 | 0.21 | 0.38 | 0.30 | 0.35 |
| W-B shear force, lbs.[2] | 23.3 | 25.4 | 20.6 | 20.4 | 21.6 | 22.9 |

1 - Use one measure; if not, indicate method.

Average of three measurements.

2 - Indicate size of core used and how meat was cooked.

One-inch core, broiled.

[a]Carcass weight and dressing percent are given as hot rather than cold.
[b]Carcass grade: Good = 10, Good+ = 11, Choice- = 12. (Federal grader)
[c]Federal grader estimate.
[d]Marbling score: Dev. = 11, trace = 10, slight = 9. (Federal grader)

FORM III
SLAUGHTER DATA, 1963

Mississippi State

| Location | Prairie | Prairie | Prairie | Prairie | Prairie | Prairie |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | Angus | Angus | Angus | Angus |
| Breed of dam | Hereford | Hereford | Angus | Angus | Angus | Angus |
| Line or group | Georgia Poll 692 | Colorado 8170 | Va. 9249 | Va. 0038 | Okla. 066 | Okla. 436 |
| Sex | Steer | Steer | Steer | Steer | Steer | Steer |
| Age at slaughter | 483 | 475 | 473 | 476 | 484 | 486 |
| No. slaughtered | 5 | 5 | 5 | 5 | 5 | 5 |
| Days in feedlot | 198 | 198 | 198 | 198 | 198 | 198 |
| Final feedlot weight | 885 | 814 | 787 | 827 | 796 | 842 |
| Slaughter wt., live | 885 | 814 | 787 | 827 | 796 | 842 |
| Carcass weight, cold[a] | 510 | 582 | 463 | 492 | 468 | 496 |
| Dressing percent, cold[a] | 57.6 | 59.2 | 58.8 | 59.6 | 58.8 | 59.0 |
| Carcass grade, quality[b] | 9.8 | 10.4 | 10.8 | 11.0 | 11.0 | 11.2 |
| Carcass grade, cutability[c] | 2.6 | 2.4 | 2.6 | 2.8 | 3.2 | 2.6 |
| Est. percent, kidney fat | | | | | | |
| Rib-eye area/100 lbs.carc.(sq.in.) | 1.97 | 2.06 | 2.32 | 2.02 | 2.24 | 2.16 |
| Marbling score, USDA[d] | 9.8 | 9.4 | 8.8 | 9.0 | 9.0 | 8.6 |
| Fat thickness over ribeye(in.)[1] | 0.37 | 0.46 | 0.45 | 0.58 | 0.52 | 0.58 |
| W-B shear force, lbs.[2] | 20.2 | 21.2 | 23.7 | 21.7 | 22.0 | 18.8 |

1 - Use one measure; if not, indicate method.

Average of three measurements.

2 - Indicate size of core used and how meat was cooked.

One-inch core; broiled

[a]Carcass weight and dressing percent are given as hot rather than cold.
[b]Carcass grade: Good = 10, Good + = 11, Choice- = 12. (Federal grader)
[c]Federal grader estimate.
[d]Marbling score: Dev. = 11, trace = 10, slight = 9. (Federal grader)

NORHT CAROLINA STATE
Agricultural Experiment Station

I. PROJECT: Animal Science H-198, AHRD Line Project d1-23 (S-10)

Genetic and Environmental Interactions for Performance and Carcass Traits in Beef Cattle

II. OBJECTIVES:

To evaluate the importance of sire-by-location interactions for performance traits.

To evaluate sire-by-location and ration interaction for gain and carcass characteristics of steer progeny.

To develop and evaluate selection criteria for the improvement of productive efficiency and market quality.

III. PERSONNEL:

E. U. Dillard, J. H. Gregory, J. E. Legates, O. W. Robison, T. N. Blumer, and Kenneth Koonce.

IV. ACCOMPLISHMENTS DURING THE YEAR:

In 1963 a total of 265 cows were in the herds forming a part of this project at the start of the breeding season. Of this number, 248 were observed in heat and inseminated one or more times. During the breeding season of approximately 90 days, 79 - or 29 percent - were inseminated a second time and 26 - or 9.8 percent - were inseminated a third time. In two herds, clean-up bulls were used the latter part of the season. Some cows were bred by clean-up bulls, but reproduction data are figured only on cows bred by artificial insemination. Performance data are included for all calves where the same breed of bull is used.

Fourteen bull calves born in 1962 were fed out and 11 were slaughtered at approximately 16.5 months of age. The average daily gain of this group of bulls on a 154-day postweaning test was higher than that of any other group fed out by the North Carolina Agricultural Experiment Station since such experiments began in 1949. The top bull finished the test at 340 days of age weighing 920 pounds, one other bull finished at 410 days weighing 1090, and a third finished at 415 days weighing 1095. Two of these bulls are being used as sires in 1964.

Due to some undesirable flavor noted in meat of bulls slaughtered in previous years, steaks from the bulls slaughtered in 1963 were sampled at 5 to 8 days after slaughter, after 4.5 months' storage, and after approximately

8 months' storage. Off-flavors were essentially absent in all tests. Therefore, aging does not appear to have been the cause of so many off-flavor steaks in previous years. Further investigation is planned in this area.

The outstanding performance on full-feed and the difference in weaning weight further emphasized the superiority of steer progeny sired by the Miles City, Montana Line 1 bull. Average carcass weight per day of age for steers born in 1962 and on grain feed prior to slaughter was as follows: Sire 6625 (Miles City Line 1) - 9 steers, 0.99 pounds; Sire 0100 - 10 steers, 0.89 pounds; and Sire 8027 - 13 steers, 0.75 pounds. The Line 1 sire also produced heifer progeny with superior 18-month weights.

The 1963 calves were sired by the Line 1 bull and by two bulls purchased in Virginia and fed in the 1960-1961 postweaning test at Raleigh. One of these, 0030, sired calves which performed as well as the progeny of the Line 1 bull when evaluated for 205-day weight, and which scored higher for type.

Data on 104 steers slaughtered in 1962 and 1963 were analyzed to see if there were indications of genetic-environmental interactions. Twenty-five items relating to live weight, carcass measurements, and cooked steaks were considered in the analysis. Main effects - i.e., location, ration, sire, and year - were significant for most carcass measurements, and ration significantly affected taste panel scores for juiciness and flavor. Interactions between ration and year were significant for percent dress, marbling score, and carcass grade. The only indication of a genotype-environment interaction was in the percent separable lean in the 9-10-11th rib cut.

Heifers, which are progeny of sires used in this project, are calving for the first time in 1964, and data on cow performance traits will soon be available for further consideration of interactions.

V. FUTURE PLANS:

No basic changes are planned. At least five years' data will be utilized before deciding on any major changes.

VI. PUBLICATIONS DURING THE YEAR:

None

VII. PUBLICATIONS PLANNED:

A publication on correction factors for use in adjusting preweaning data is being prepared.

A publication relating to correlation between dam weight and calf weight is planned.

Submitted by: E. U. Dillard

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

North Carolina State

| Location | Raleigh | Plymouth | Laurel Springs | Butner | | |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | Hereford | Hereford | | |
| Breed of dam | Hereford | Hereford | Hereford | Hereford | | |
| Line or group[1] | Purebred | Grade | Grade | Grade | | |
| No. cows exposed[2] | 52 | 70 | 52 | 73 | | |
| No. calves born[3] | 32[a] | 53 | 40 | 57 | | |
| Calving percent, born | 61.5 | 75.7 | 76.9 | 78.1 | | |
| Av. birth date | 2-18-63 | 2-22-63 | 2-10-63 | 12-31-62 | | |
| Av. birth wt. | 63 | 71 | 68 | 68 | | |
| No. calves weaned | 43[a] | 50 | 34 | 51 | | |
| Calving percent, weaned[4] | 82.7 | 71.4 | 65.4 | 69.9 | | |
| Av. weaning age, days | 199 | 206 | 203 | 207 | | |
| Adj. ADG[5] | 1.61 | 1.76 | 1.63 | 1.59 | | |
| Av. type sc.[6] | 9.5 | 9.2 | 9.0 | 9.9 | | |
| Av. cond. sc.[6] | | | | | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

See Virginia Bulletin No. 489, p. 26, season 1 only.

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

[a]Calves obtained from a clean-up bull are not included in "No. calves born" but are included in "No. calves weaned". These calves were crossbred and were not left in the breeding herd.

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

North Carolina State

| | Location | Raleigh | Plymouth | Plymouth | L.Springs | L.Springs | |
|---|---|---|---|---|---|---|---|
| | Breed of sire | Hereford | Hereford | Hereford | Hereford | Hereford | |
| | Breed of dam | Hereford | Hereford | Hereford | Hereford | Hereford | |
| | Line or group[1] | Purebred | Grade | | Grade | | |
| Bulls | No. in group | 14 | | | | | |
| | Av. init. age | 243 | | | | | |
| | Av. init. wt. | 438.2 | | | | | |
| | Av.no.da.fed | 154 | | | | | |
| | Av. final wt. | 920.0 | | | | | |
| | ADG on test | 3.12 | | | | | |
| | Av. type sc. | 11.0 | | | | | |
| | Av. cond. sc. | 10.6 | | | | | |
| | Av. inbreeding | 0 | | | | | |
| Heifers | No. in group | 11 | 22 | | 11 | | |
| | Av. init. age | | | | | | |
| | Av. init. wt. | | | | | | |
| | Av.no.da.fed | | | | | | |
| | Av. final wt.[a] | 616.5 | 734.3 | | 704.2 | | |
| | ADG on test | | | | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | | | | | | |
| | Av. inbreeding | | | | | | |
| Steers | No. in group | | 12 | 11 | 12 | 12 | |
| | Av. init. age | | 405 | 392 | 444 | 439 | |
| | Av. init. wt. | | 557.1 | 534.5 | 637.5 | 608.3 | |
| | Av.no.da.fed | | | 209 | | 162 | |
| | Av. final wt.[b] | | 729.2 | 950.9 | 815.8 | 944.2 | |
| | ADG on test | | 0.81 | 1.98 | 1.10 | 2.07 | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc.[c] | | 7.0 | 10.7 | 8.6 | 11.6 | |
| | Av. inbreeding | | 0 | 0 | 0 | 0 | |

1 - Show whether station or cooperator owned, in addition to other group designation.

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | Full-fed complete ration | Limited fed for growth only | Full-fed |
| Pounds/day over feeding period | 23.48 | | |
| Ration: | 1275 lbs. gr.sn.corn<br>400 lbs. gr.corn cobs<br>100 lbs. dehy.alf.meal<br>200 lbs. soybean oil meal<br>12 lbs. deflour. phosphate<br>6 lbs. gr. limestone<br>7 lbs. TM salt | | Plymouth<br>13.19 lbs. Gr.ear corn<br>3.29 lbs. CS oil meal<br>2.81 lbs. mixed grass hay<br>Laurel Springs<br>10.60 lbs. gr. corn<br>7.26 lbs. alf. mixed grass hay<br>2.65 lbs. CSM |

[a]Heifer weights are 18-month weights.
[b]Shrunk weight at farm after being off feed overnight for steers.
[c]Live slaughter grade.

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

North Carolina _____ State

| | | | | | | |
|---|---|---|---|---|---|---|
| Location | Butner | Butner | | | | |
| Breed of sire | Hereford | Hereford | | | | |
| Breed of dam | Hereford | Hereford | | | | |
| Line or group[1] | | | | | | |
| Bulls: No. in group | | | | | | |
| Bulls: Av. init. age | | | | | | |
| Bulls: Av. init. wt. | | | | | | |
| Bulls: Av. no. da. fed | | | | | | |
| Bulls: Av. final wt. | | | | | | |
| Bulls: ADG on test | | | | | | |
| Bulls: Av. type sc. | | | | | | |
| Bulls: Av. cond. sc. | | | | | | |
| Bulls: Av. inbreeding | | | | | | |
| Heifers: No. in group | 19 | | | | | |
| Heifers: Av. init. age | | | | | | |
| Heifers: Av. init. wt. | | | | | | |
| Heifers: Av. no. da. fed | | | | | | |
| Heifers: Av. final wt. | 764.7 | | | | | |
| Heifers: ADG on test | | | | | | |
| Heifers: Av. type sc. | | | | | | |
| Heifers: Av. cond. sc. | | | | | | |
| Heifers: Av. inbreeding | | | | | | |
| Steers: No. in group | 9 | 9 | | | | |
| Steers: Av. init. age | 466 | 478 | | | | |
| Steers: Av. init. wt. | 575.6 | 591.7 | | | | |
| Steers: Av. no. da. fed | | 190 | | | | |
| Steers: Av. final wt. | 726.7 | 948.9 | | | | |
| Steers: ADG on test | 0.79 | 1.88 | | | | |
| Steers: Av. type sc. | | | | | | |
| Steers: Av. cond. sc. | 6.6 | 11.0 | | | | |
| Steers: Av. inbreeding | 0 | 0 | | | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | | Fed for breeding as yearlings | Full-fed |
| Pounds/day over feeding period | | | |
| Ration: | | | 9.0 lbs. gr. sh. corn<br>1.0 lbs. soybean oil meal<br>5.2 lbs. fescue hay<br>7.2 lbs. bull ration (see preceeding page) |

[a]Heifer weights are 18-month weights.
[b]Shrunk weight off feed at farm.
[c]Live animal slaughter grade.

FORM III
SLAUGHTER DATA, 1963

North Carolina State

| Location | Plymouth | L. Springs | Butner | Raleigh | | |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | Hereford | Hereford | | |
| Breed of dam | Hereford | Hereford | Hereford | Hereford | | |
| Line or group | | | | | | |
| Sex | Steers | Steers | Steers | Bulls | | |
| Age at slaughter | 606 | 601 | 668 | 501 | | |
| No. slaughtered | 11 | 12 | 9 | 11 | | |
| Days in feedlot | 210 | 162 | 190 | 205 | | |
| Final feedlot weight | 979.5 | 967.5 | 975.0 | 1023.1 | | |
| Slaughter wt., live[a] | 908.2 | 908.3 | 940.6 | 998.1 | | |
| Carcass wt., cold | 528.0 | 553.7 | 564.2 | 597.7 | | |
| Dressing percent, cold | 58.02 | 60.99 | 59.95 | 59.90 | | |
| Carcass grade, quality | 11.4 | 11.4 | 12.0 | 6.9 | | |
| Carcass grade, cutability | 3.90 | 4.78 | 4.43 | 3.31 | | |
| Est. percent, kidney fat | 3.01 | 2.94 | 2.89 | 2.65 | | |
| Rib-eye area/100 lbs. carc. (sq. in.) | 1.91 | 1.70 | 1.68 | 1.94 | | |
| Marbling score, USDA | 15.3 | 15.4 | 18.8 | 10.9 | | |
| Fat thickness over ribeye(in.)[1] | 11.97 | 22.96 | 18.94 | 14.10 | | |
| W-B shear force, lbs.[2] | 10.65 | 8.63 | 11.83 | 9.80 | | |

1 - Use one measure; if not, indicate method.

Measured in centimeters. Average of 3 distances drawn perpendicular to outside surface of fat and connecting to 3 lines measured perpendicular to points equidistant on a line drawn through the longest part of the rib eye.

2 - Indicate size of core used and how meat was cooked.

3/4" core - two steaks broiled to an internal temperature of 160° F.

[a]Weight at slaughter plant. In the case of Plymouth and Butner, these cattle were killed one day later than planned; thus plant weights and empty farm weights do not always correspond as expected.

FORM III
SLAUGHTER DATA, 1963

_ North Carolina _ State

| Location | Plymouth | L.Springs | Butner | | | |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | Hereford | | | |
| Breed of dam | Hereford | Hereford | Hereford | | | |
| Line or group | Pasture | Pasture | Pasture | | | |
| Sex | Steers | Steers | Steers | | | |
| Age at slaughter | 614 | 611 | 656 | | | |
| No. slaughtered | 12 | 12 | 9 | | | |
| Days in feedlot | | | | | | |
| Final feedlot weight | 765.4 | 863.8 | 765.0 | | | |
| Slaughter weight, live[a] | 685.0 | 795.0 | 740.6 | | | |
| Carcass weight, cold | 363.1 | 444.7 | 401.6 | | | |
| Dressing percent, cold | 52.97 | 55.91 | 54.34 | | | |
| Carcass grade, quality | 8.1 | 8.1 | 7.4 | | | |
| Carcass grade, cutability | 2.67 | 2.58 | 2.63 | | | |
| Est. percent, kidney fat | 1.86 | 2.12 | 1.89 | | | |
| Rib-eye area/100 lbs.carc.(sq.in.) | 2.16 | 2.19 | 2.11 | | | |
| Marbling score, USDA | 9.3 | 9.3 | 8.2 | | | |
| Fat thickness over ribeye(in.)[1] | 5.94 | 7.88 | 5.89 | | | |
| W-B shear force, lbs.[2] | 13.57 | 13.16 | 13.57 | | | |

1 - Use one measure; if not, indicate method.
Measured in centimeters. Average of 3 distances drawn perpendicular to outside surface of fat and connecting to 3 lines measured perpendicular to points equidistant on a line drawn through the longest part of the rib eye.

2 - Indicate size of core used and how meat was cooked.
3/4" core - two steaks cooked (broiled) to internal temperature of 160° F.

[a] Weight at slaughter plant. In the case of Plymouth and Butner, these cattle were killed one day later than planned, thus plant weights and empty farm weights do not always correspond as expected.

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

South Carolina State

| Location | Clemson | Clemson | Clemson | Clemson | | |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Angus | Hereford | Hereford | | |
| Breed of dam | Angus | Angus | Hereford | Hereford | | |
| Line or group[1] | G-34 | G-101 | CB Rollo | Goldmine | | |
| No. cows exposed[2] | 29 | 30 | 25 | 22 | | |
| No. calves born[3] | 28 | 28 | 21 | 18 | | |
| Calving percent, born | 96.6 | 93.3 | 84.0 | 81.8 | | |
| Av. birth date | 2-03-63 | 1-27-63 | 2-12-63 | 1-29-63 | | |
| Av. birth wt. | 63.2 | 61.0 | 70.9 | 66.1 | | |
| No. calves weaned | 23 | 22 | 18 | 18 | | |
| Calving percent, weaned[4] | 79.31 | 73.33 | 72.00 | 81.82 | | |
| Av. weaning age, days | 209 | 210 | 205 | 208 | | |
| Adj. ADG[5] | 2.20 | 2.06 | 2.05 | 2.04 | | |
| Av. type sc.[6] | 10.9 | 11.5 | 10.5 | 10.8 | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

Gain adjusted for age of dam, sex of calf, and creep feeding

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

FORM II
COW PRODUCTION, 1963 CALF CROP (1962-1963)

South Carolina State

| Location | Summerville | Summerville | Summerville | Summerville | | |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Angus | Hereford | Hereford | | |
| Breed of dam | Angus | Angus | Hereford | Hereford | | |
| Line or group[1] | EEB | C Ank | J Misch | Ch Adv | | |
| No. cows exposed[2] | 29 | 29 | 19 | 19 | | |
| No. calves born[3] | 22[a] | 26 | 16[b] | 14[b] | | |
| Calving percent, born | 75.9 | 89.7 | 84.2 | 73.7 | | |
| Av. birth date | 2-02-63 | 2-03-63 | 1-31-63 | 2-01-63 | | |
| Av. birth wt. | 63.7 | 70.1 | 67.9 | 71.0 | | |
| No. calves weaned | 21 | 23 | 16 | 13 | | |
| Calving percent, weaned[4] | 72.41 | 79.31 | 84.21 | 68.42 | | |
| Av. weaning age, days | 212 | 209 | 210 | 210 | | |
| Adj. ADG[5] | 1.72 | 1.76 | 1.56 | 1.71 | | |
| Av. type sc.[6] | 11.3 | 11.1 | 10.2 | 11.1 | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

Gain adjusted for age of dam, sex of calf, and creep feeding.

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

[a]Two cows sold before calving that were pregnant.
[b]One cow sold before calving that was pregnant.

CLEMSON UNIVERSITY
Agricultural Experiment Station

I. PROJECT: SC-479 (S-10)

The Response of Sire Progenies to Management and Feeding Procedures

II. OBJECTIVES:

To investigate the response of sire progenies, as measured by live animal and carcass traits, to methods of producing slaughter cattle.

To evaluate the magnitude and importance of the average genotype with certain environmental influences.

To develop, through selection, herds of beef cattle with superior performance under South Carolina conditions.

III. PERSONNEL:

W. C. Godley, H. H. Pierce, G. C. Skelley, Mary J. Marbut, R. M. Rauton, R. R. Ritchie, and J. H. Mitchell, Jr.

IV. ACCOMPLISHMENTS DURING THE YEAR:

The breeding herds which produced the 1963 calf crop were composed of 85 purebred Polled Hereford cows and 117 purebred Angus cows. The 65 Hereford calves weaned were the progeny of four bulls, and the 89 Angus calves were also sired by four bulls. One Hereford bull was eliminated due to the performance of his offspring, and he was replaced for the 1963 breeding season by a bull with an excellent record purchased from one of the top herds in the state. To keep inbreeding at a minimum, one of the Angus bulls that had been used in the project for several years was replaced by a bull that was selected on the basis of the performance of his offspring at the Edisto station.

All cows were checked for pregnancy in September 1962. A summary of the results of the 1962 breeding season is presented in table 1.

TABLE 1. Summary of 1962 Breeding Season

| | Coast Station | Clemson Station |
|---|---|---|
| No. cows exposed | 96 | 106 |
| No. cows diagnosed pregnant | 85 | 96 |
| No. cows died or sold pregnant | 4 | 1 |
| No. calves born | 78 | 95 |
| No. calves weaned | 73 | 81 |
| Calving percent, weaned | 79.35 | 76.41 |

Twenty cows that were exposed during the breeding season but were open as determined by the pregnancy check were assembled at the Clemson Station. They were checked twice daily for visual signs of estrus and twice weekly by rectal palpation for a 10-week period. Cows showing visual signs of estrus were bred by artificial insemination. Table 2 presents a summary of this work

TABLE 2. Results of AI on Hard Breeding Beef Cows

| | |
|---|---|
| Number on test | 20 |
| Number cycling during 10-week period, as determined by rectal palpation | 20 |
| Number showing estrus and inseminated | 18 |
| Number diagnosed pregnant | 8 |
| Percent inseminated diagnosed pregnant | 44 |

Fourteen Angus bull calves, sired by four bulls, and six Hereford calves, sired by three bulls, were selected as possible herd sires and were fed on pasture on a 140-day ROP feeding trial. Twenty-two Angus and eleven Hereford steers were fed or postweaning feeding test. The steers were slaughtered and detailed carcass data were obtained. Seventeen Angus and six Hereford heifers were also fed on postweaning feeding trials.

A beef cattle feeding barn was completed during the year and research units have been relocated.

V. FUTURE PLANS:

The project will be reviewed critically during the next year and will be revised if deemed desirable.

VI. PUBLICATIONS DURING THE YEAR:

None

VII. PUBLICATIONS PLANNED:

One Master's thesis is in preparation and it is anticipated that it will be published during 1964.

Submitted by: W. C. Godley

# FORM II
# POSTWEANING PERFORMANCE OF CALVES FED IN 1963

South Carolina State

| | | | | | | |
|---|---|---|---|---|---|---|
| Location | Clemson | Clemson | Clemson | Clemson | | |
| Breed of sire | Angus | Angus | Hereford | Hereford | | |
| Breed of dam | Angus | Angus | Hereford | Hereford | | |
| Line or group[1] | CBB2 | C Ank | CH Adv | Super Rol | | |
| Bulls: No. in group | 2 | 3 | 2 | | | |
| Bulls: Av. init. age | 216 | 217 | 223 | | | |
| Bulls: Av. init. wt. | 530 | 500 | 490 | | | |
| Bulls: Av.no.da.fed | 140 | 140 | 140 | | | |
| Bulls: Av. final wt. | 812 | 785 | 782 | | | |
| Bulls: ADG on test | 2.02 | 2.04 | 2.09 | | | |
| Bulls: Av. type sc. | | | | | | |
| Bulls: Av. cond. sc. | 12.7 | 11.4 | 10.9 | | | |
| Bulls: Av. inbreeding | | | | | | |
| Heifers: No. in group | 9 | 8 | 3 | 3 | | |
| Heifers: Av. init. age | 266 | 247 | 260 | 266 | | |
| Heifers: Av. init. wt. | 454.0 | 421.3 | 429.3 | 422.7 | | |
| Heifers: Av.no.da.fed | 186 | 203 | 196 | 196 | | |
| Heifers: Av. final wt. | 758.4 | 757.1 | 800.0 | 762.7 | | |
| Heifers: ADG on test | 1.66 | 1.67 | 1.94 | 1.74 | | |
| Heifers: Av. type sc. | | | | | | |
| Heifers: Av. cond. sc. | 12.1 | 11.6 | 12.0 | 11.2 | | |
| Heifers: Av. inbreeding | | | | | | |
| Steers: No. in group | 8 | 7 | 6 | 3 | | |
| Steers: Av. init. age | 268 | 262 | 251 | 245 | | |
| Steers: Av. init. wt. | 489.0 | 534.3 | 432.3 | 416.0 | | |
| Steers: Av.no.da.fed | 192 | 188 | 196 | 196 | | |
| Steers: Av. final wt. | 838.1 | 930.0 | 786.7 | 736.7 | | |
| Steers: ADG on test | 1.82 | 2.11 | 1.83 | 1.67 | | |
| Steers: Av. type sc. | | | | | | |
| Steers: Av. cond. sc. | 12.0 | 12.1 | 11.2 | 11.0 | | |
| Steers: Av. inbreeding | | | | | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | Full-fed | | |
| Pounds/day over feeding period | | | |
| Ration: | 400 lbs. cr. oats<br>200 lbs. alf. pellets<br>450 lbs. CS hulls<br>200 lbs. wheat bran<br>100 lbs. 32% supplement<br>90 lbs. blackstrap molasses<br>400 lbs. cracked corn | Heifers and steers within sire groups were randomly assigned where possible to (1) dry lot plus Coastal Bermuda hay or pellets, (2) fescue pasture plus full or limited ration of shelled corn + 1 lb. 36% cottonseed meal per head per day, or (3) rye grass-crimson clover pasture + full or limited ration of shelled corn. | |

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

South Carolina State

| | Location | Summerville | Summerville | Summerville | Summerville | Summerville |
|---|---|---|---|---|---|---|
| | Breed of sire | Angus | Angus | Angus | Hereford | Hereford |
| | Breed of dam | Angus | Angus | Angus | Hereford | Hereford |
| | Line or group[1] | G-34 | BI 4709 | B 1047 | Vic Dom | Goldmine |
| Bulls | No. in group | 3 | | | | 2 |
| | Av. init. age | 221 | | | | 217 |
| | Av. init. wt. | 518.3 | | | | 450.0 |
| | Av.no.da.fed | 140 | | | | 140 |
| | Av. final wt. | 870.0 | | | | 657.5 |
| | ADG on test | 2.51 | | | | 1.65 |
| | Av. type sc. | | | | | |
| | Av. cond. sc. | 11.90 | | | | 11.15 |
| | Av. inbreeding | | | | | |
| Heifers | No. in group | | | | | |
| | Av. init. age | | | | | |
| | Av. init. wt. | | | | | |
| | Av.no.da.fed | | | | | |
| | Av. final wt. | | | | | |
| | ADG on test | | | | | |
| | Av. type sc. | | | | | |
| | Av. cond. sc. | | | | | |
| | Av. inbreeding | | | | | |
| Steers | No. in group | 3 | 1 | 3 | 2 | 2 |
| | Av. init. age | 249 | 253 | 233 | 271 | 262 |
| | Av. init. wt. | 461.3 | 530.0 | 412.0 | 466.0 | 397.0 |
| | Av.no.da.fed | 224 | 224 | 196 | 182 | 182 |
| | Av. final wt. | 855.0 | 1004.0 | 784.3 | 885.5 | 792.5 |
| | ADG on test | 1.76 | 2.12 | 1.90 | 2.37 | 2.15 |
| | Av. type sc. | | | | | |
| | Av. cond. sc. | 11.4 | 12.5 | 11.3 | 11.0 | 10.3 |
| | Av. inbreeding | | | | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | Full-fed | | |
| Pounds/day over feeding period | | | |
| Ration: | 400 lbs. cr. oats<br>200 lbs. alf. pellets<br>450 lbs. CS bulls<br>200 lbs. wheat bran<br>100 lbs. 32% supplement<br>90 lbs. blackstrap molasses<br>400 lbs. cracked corn | Heifers and steers within sire groups were randomly assigned where possible to (1) dry lot plus Coastal Bermuda hay or pellets, (2)fescue pasture + full or limited ration of shelled corn + 1 lb. 36% cottonseed meal per head per day, or (3) rye grass-crimson clover pasture + full or limited ration of shelled corn. | |

FORM III
SLAUGHTER DATA, 1963

South Carolina State

| Location | Clemson | Clemson | Clemson | Clemson | Clemson | |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Angus | Hereford | Hereford | Angus | |
| Breed of dam | Angus | Angus | Hereford | Hereford | Angus | |
| Line or group | G-34 | B 1047 | Goldmine | Vic Dom | BI 4709 | |
| Sex | Steer | Steer | Steer | Steer | Steer | |
| Age at slaughter | 482 | 467 | 453 | 462 | 486 | |
| No. slaughtered | 3 | 3 | 2 | 2 | 1 | |
| Days in feedlot | 224 | 196 | 182 | 182 | 224 | |
| Final feedlot weight | 855.0 | 784.3 | 792.5 | 885.5 | 1004.0 | |
| Slaughter wt., live | 845.0 | 778.0 | 785.0 | 857.5 | 1010.0 | |
| Carcass weight, cold | 488.3 | 453.6 | 444.3 | 496.7 | 595.6 | |
| Dressing percent, cold | 57.83 | 57.87 | 56.35 | 57.88 | 58.97 | |
| Carcass grade, quality | 11.7 | 12.0 | 10.0 | 11.0 | 10.0 | |
| Carcass grade, cutability | 3.27 | 3.26 | 2.60 | 3.10 | 3.40 | |
| Est. percent kidney fat | | | | | | |
| Rib-eye area/100 lbs. car.(sq.in.) | 1.96 | 2.34 | 2.07 | 2.21 | 1.91 | |
| Marbling score, USDA | 14.0 | 14.3 | 10.5 | 11.0 | 10.0 | |
| Fat thickness over ribeye(in.)[1] | 0.66 | 0.59 | 0.44 | 0.56 | 1.03 | |
| W-B shear force, lbs.[2] | 9.8 | 13.0 | 12.1 | 11.8 | 10.2 | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

one-inch core - steaks broiled

FORM III
SLAUGHTER DATA, 1963

South Carolina State

| Location | Clemson | Clemson | Clemson | Clemson | | |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Angus | Hereford | Hereford | | |
| Breed of dam | Angus | Angus | Hereford | Hereford | | |
| Line or group | C Ank | CBB 2 | Ch Adv | Super Rol | | |
| Sex | Steer | Steer | Steer | Steer | | |
| Age at slaughter | 467 | 470 | 452 | 451 | | |
| No. slaughtered | 7 | 8 | 6 | 3 | | |
| Days in feedlot | 188 | 192 | 196 | 196 | | |
| Final feedlot weight | 930.0 | 838.1 | 786.7 | 736.7 | | |
| Slaughter wt., live | 907.9 | 819.4 | 764.2 | 713.3 | | |
| Carcass wt., cold | 540.3 | 481.4 | 441.6 | 426.8 | | |
| Dressing percent, cold | 59.55 | 58.71 | 57.72 | 59.83 | | |
| Carcass grade quality | 13.0 | 13.0 | 11.7 | 9.3 | | |
| Carcass grade cutability | 3.5 | 3.6 | 3.2 | 2.8 | | |
| Est. percent, kidney fat | | | | | | |
| Rib-eye area/100 lbs. car.(sq.in.) | 2.05 | 1.95 | 2.20 | 2.72 | | |
| Marbling score, USDA | 17.7 | 17.3 | 13.5 | 9.0 | | |
| Fat thickness over ribeye(in.)[1] | 0.76 | 0.78 | 0.56 | 0.43 | | |
| W-B shear force, lbs.[2] | 12.1 | 12.5 | 11.4 | 15.0 | | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

One-inch core - steaks broiled

UNIVERSITY OF TENNESSEE
Agricultural Experiment Station

I. PROJECT: Hatch 61, AHRD Line Project d1-9 (S-10)

The Improvement of the Producing Ability of Beef Cattle

II. OBJECTIVES:

To develop lines, line crosses, or combinations of lines and crosses of beef cattle which will make the most efficient use of Tennessee pastures and forages and which will result in an improvement of such characters as rate of gain, economy of gain, carcass quality, fertility, and longevity.

To develop effective breeding techniques for the improvement of existing lines of beef cattle.

To investigate the effect of different levels of nutrition on the development of type and conformation, economy of gain, fertility, and longevity.

III. PERSONNEL:

C. S. Hobbs, L. L. Christian, J. W. Cole, C. B. Ramsey, J. B. McLaren, R. A. Reynolds, W. T. Butts, G. R. Wilson, J. H. Felts, and J. A. Odom.

IV. ACCOMPLISHMENTS DURING THE YEAR:

Performance records from birth to weaning were collected on about 604 calves. These data include performance records on progeny of 20 Hereford sires at three locations and 19 Angus sires at three locations to obtain basic data on mature size and variation in condition at different locations and between years.

Two groups of cows which were irradiated in 1961 and 1962 in connection with the UT-AEC project to evaluate the effect of irradiation on lifetime performance, calved in 1963. Performance records from birth to weaning and in the feedlot were collected on these calves. No significant differences were observed between the various levels of radiation (0, 200r, 300r, 400r, and 600r in two 300r doses). Carcass data were obtained on 24 heifer and 58 steer progeny by four sires from the 1962 calf crop. Carcass data will be obtained on 95 steers and 83 heifers by eight sires from the 1963 calves.

Forty-one Hereford and Angus bull calves from various stations were used to compare three methods of developing herd bulls from weaning to approximately 20 months of age. Sixty-four Angus bull calves from one location and 49 Hereford and Angus bull calves from other locations were fed from weaning to approximately 20 months of age to obtain performance data on individuals and sire progeny.

Carcass data were obtained on 42 Hereford steers sired by four sires and 60 Hereford heifers by seven sires. Two locations are represented in this study.

Fifteen bull, steer, and heifer trios were selected from various stations to study the effect of sex on performance and carcass traits. Data from this study will be presented in 1964.

In the cooperative program with the extension service, individual calf records have been processed on 3596 calves and summaries by sire, progeny, and herds have been made for 123 breeders.

Known dwarf tester cows have been moved from UT-AEC to the Ames and Alcoa units. These cows will be used to check herd sire prospects for possible dwarfism genes, although bulls are free from dwarfism as far as can be determined from available pedigree information.

A revised system of keeping breeding herd records, making use of punched cards, was instituted during the year. This system includes the routine calculation of inbreeding and numerator relationship coefficients for animals in several of the experimental herds.

## V. FUTURE PLANS:

Present work on getting all sire and dam progeny data listed at approximately 120-140 days and at weaning time will continue. Weights and condition grades will be obtained on cows at about weaning time (November 1) and, in certain herds, on January 1 and July 1.

Studies on present and new methods of breeding systems and developing lines will continue at different stations.

The carcass evaluation and consumer acceptance phases will be expanded.

Additional use will be made of the IBM system for more detailed analyses and studies, especially in reference to heritability estimates, correlation of live and carcass evaluation, lifetime cow performance, and so forth.

## VI. PUBLICATIONS DURING THE YEAR:

Cole, J. W., C. B. Ramsey, C. S. Hobbs, and R. S. Temple. 1963. Effects of type and breed of British, zebu, and dairy cattle on production, palatability, and composition. I. Rate of gain, feed efficiency, and factors affecting market value. J. Animal Sci. 22:702.

Merriman, G. M. 1963. Pregnancy determinations in beef cows. Tennessee Farm and Home Sci., Progress Report 46.

Ramsey, C. B., J. W. Cole, B. H. Meyer, and R. S. Temple. 1963. Effects of type and breed of British, zebu, and dairy cattle on production, palatability, and composition. II. Palatability differences and cooking losses as determined by laboratory and family panels. J. Animal Sci. 22:1001.

VII. PUBLICATIONS PLANNED:

None

Submitted by C. S. Hobbs

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Tennessee — State

| Location | Alcoa | Alcoa | Alcoa | Alcoa | Alcoa | Alcoa |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | Hereford | Hereford | Angus | Hereford |
| Breed of dam | Hereford | Hereford | Hereford | Hereford | Angus | Hereford |
| Line or group[1] | 2020 | 2433 | 5241 | 9035 | 9163 | 9217 |
| No. cows exposed[2] | 17 | 6 | 17 | 22 | 29 | 33 |
| No. calves born[3] | 8 | 4 | 5 | 15 | 23 | 14 |
| Calving percent, born | 47 | 67 | 29 | 68 | 79 | 42 |
| Av. birth date | 2-23-63 | 3-01-63 | 3-12-63 | 3-02-63 | 3-01-63 | 3-06-63 |
| Av. birth wt. | 73 | 63 | 91 | 73 | 75 | 73 |
| No. calves weaned | 5 | 2 | 3 | 11 | 21 | 14 |
| Calving percent, weaned[4] | a | a | 17.6 | a | 72.4 | a |
| Av. weaning age, days | 229 | 224 | 212 | 222 | 223 | 218 |
| Adj. ADG[5] | 1.45 | 1.46 | 1.89 | 1.75 | 1.86 | 1.69 |
| Av. type sc.[6] | 12.1 | 11.5 | 11.8 | 12.0 | 12.5 | 11.9 |
| Av. cond. sc.[6] | 9.2 | 7.8 | 9.2 | 9.0 | 9.9 | 8.6 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

[a]Calves older than 300 days when weighed, sick calves, calves raised by foster dams, and calves sold before weaning were not included.

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Tennessee State

| Location | Alcoa | Alcoa | Alcoa | Oak Ridge | Oak Ridge | Oak Ridge |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | Angus | Hereford | Hereford | Hereford |
| Breed of dam | Hereford | Hereford | Angus | Hereford | Hereford | Hereford |
| Line or group[1] | 9505 | 9605 | 9609 | 6400 | 2196 | 2465 |
| No. cows exposed[2] | 14 | 27 | 26 | 27 | 27 | 27 |
| No. calves born[3] | 9 | 24 | 20 | 24 | 24 | 26 |
| Calving percent, born | 64 | 89 | 77 | 89 | 89 | 96 |
| Av. birth date | 3-21-63 | 2-16-63 | 3-14-63 | 2-17-63 | 2-14-63 | 2-11-63 |
| Av. birth wt. | 66 | 74 | 77 | 67 | 67 | 67 |
| No. calves weaned | 4 | 23 | 20 | 24 | 23 | 26 |
| Calving percent, weaned[4] | a | 85.1 | 76.9 | 88.9 | 85.2 | 96.3 |
| Av. weaning age, days | 202 | 236 | 210 | 236 | 239 | 242 |
| Adj. ADG[5] | 1.64 | 1.84 | 1.81 | 1.67 | 1.66 | 1.71 |
| Av. type sc.[6] | 12.6 | 12.3 | 12.8 | 11.2 | 11.7 | 12.2 |
| Av. cond. sc.[6] | 8.8 | 9.5 | 9.4 | 7.7 | 7.9 | 8.3 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

[a]Calves older than 300 days, sick calves, calves raised by foster dams, and calves sold before weaning were not included.

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Tennessee State

| Location | Oak Ridge | Oak Ridge | Oak Ridge | Oak Ridge | Oak Ridge | Greeneville |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | Hereford | Hereford | Hereford | P.Hereford |
| Breed of dam | Hereford | Hereford | Hereford | Hereford | Hereford | P.Hereford |
| Line or group[1] | 4099 | 4279 | 6079 | 9490 | 9618 | 4090[b] |
| No. cows exposed[2] | 27 | 27 | 28 | 28 | 28 | 19 |
| No. calves born[3] | 25 | 26 | 21 | 27 | 23 | 6 |
| Calving percent, born | 93 | 96 | 78 | 96 | 82 | 32 |
| Av. birth date | 2-21-63 | 3-05-63 | 2-27-63 | 2-27-63 | 2-16-63 | 2-15-63 |
| Av. birth wt. | 71 | 67 | 68 | 70 | 68 | 80 |
| No. calves weaned | 22 | 21 | 20 | 26 | 19 | 5 |
| Calving percent, weaned[4] | 81.5 | 77.8 | 74.1 | 92.9 | a | a |
| Av. weaning age, days | 232 | 220 | 226 | 226 | 237 | 227 |
| Adj. ADG[5] | 1.78 | 1.75 | 1.74 | 1.85 | 1.68 | 1.90 |
| Av. type sc.[6] | 12.2 | 12.2 | 12.1 | 11.6 | 12.3 | 12.8 |
| Av. cond. sc.[6] | 8.5 | 8.5 | 8.3 | 8.1 | 8.6 | 10.3 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

[a]Calves older than 300 days when weighed, sick calves, calves raised by foster dams, and calves sold before weaning were not included.

[b]In pasture approximately 8 weeks.

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Tennessee State

| Location | Greeneville | Greeneville | Greeneville | Greeneville | Crossville | Crossville |
|---|---|---|---|---|---|---|
| Breed of sire | P.Hereford | P.Hereford | P.Hereford | P.Hereford | Angus | Angus |
| Breed of dam | P.Hereford | P.Hereford | P.Hereford | P.Hereford | Angus | Angus |
| Line or group[1] | 4221 | 9121 | 9983 | 4161[b] | 1011[c] | 1249 |
| No. cows exposed[2] | 14 | 15 | 25 | 12 | 24 | 22 |
| No. calves born[3] | 11 | 13 | 21 | 8 | 8 | 18 |
| Calving percent, born | 79 | 87 | 84 | 67 | 33 | 82 |
| Av. birth date | 2-13-63 | 2-25-63 | 2-18-63 | 3-28-63 | 2-07-63 | 3-16-63 |
| Av. birth wt. | 73 | 70 | 77 | 67 | 67 | 64 |
| No. calves weaned | 9 | 11 | 13 | 8 | 7 | 13 |
| Calving percent, weaned[4] | a | a | a | a | a | a |
| Av. weaning age, days | 229 | 217 | 224 | 186 | 254 | 217 |
| Adj. ADG[5] | 1.98 | 1.96 | 1.91 | 1.76 | 2.09 | 2.08 |
| Av. type sc.[6] | 11.7 | 12.4 | 12.3 | 10.9 | 13.4 | 12.3 |
| Av. cond. sc.[6] | 10.2 | 10.0 | 9.7 | 8.5 | 9.9 | 9.6 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

[a]Calves older than 300 days when weighed, sick calves, calves raised by foster dams, and calves sold before weaning were not included.
[b]In pasture approximately 4 weeks.
[c]Artificial insemination.

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Tennessee State

| Location | Crossville | Crossville | Crossville | Crossville | Crossville | Crossville |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Angus | Angus | Angus | Angus | Angus |
| Breed of dam | Angus | Angus | Angus | Angus | Angus | Angus |
| Line or group[1] | 5071 | 5244 | 5420 | 9209[b] | 9309 | 9709[c] |
| No. cows exposed[2] | 14 | 14 | 19 | 46 | 24 | 13 |
| No. calves born[3] | 10 | 12 | 18 | 38 | 15 | 7 |
| Calving percent, born | 71 | 86 | 95 | 83 | 62 | 54 |
| Av. birth date | 3-29-63 | 3-12-63 | 3-10-63 | 3-10-63 | 3-29-63 | 4-26-63 |
| Av. birth wt. | 56 | 61 | 61 | 61 | 61 | 65 |
| No. calves weaned | 5 | 11 | 16 | 36 | 14 | 5 |
| Calving percent, weaned[4] | a | 78.6 | 84.2 | a | a | a |
| Av. weaning age, days | 204 | 221 | 223 | 223 | 204 | 176 |
| Adj. ADG[5] | 2.05 | 1.98 | 1.91 | 2.01 | 2.04 | 2.22 |
| Av. type sc.[6] | 12.1 | 12.7 | 11.7 | 13.0 | 11.6 | 12.3 |
| Av. cond. sc.[6] | 9.5 | 10.2 | 9.3 | 9.8 | 9.1 | 9.2 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

[a]Calves older than 300 days when weighed, sick calves, calves raised by foster dams, and calves sold before weaning were not included.
[b]Artificial insemination and pasture.
[c]Artificial insemination.

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Tennessee State

| Location | Crossville | Ames | Ames | Ames | Ames | Ames |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Angus | Angus | Angus | Angus | Angus |
| Breed of dam | Angus | Angus | Angus | Angus | Angus | Angus |
| Line or group[1] | 9777[b] | 9777[c] | 9385 | 9257 | 9193 | 9148 |
| No. cows exposed[2] | 24 | | | | | |
| No. calves born[3] | 12 | 75 | 15 | 21 | 9 | 19 |
| Calving percent, born | 50 | | | | | |
| Av. birth date | 2-06-63 | 1-21-63 | 1-18-63 | 3-09-63 | 3-02-63 | 3-01-63 |
| Av. birth wt. | 60 | 58 | 54 | 53 | 52 | 58 |
| No. calves weaned | 10 | 63 | 11 | 18 | 9 | 17 |
| Calving percent, weaned | a | a | a | a | a | a |
| Av. weaning age, days | 255 | 273 | 277 | 225 | 233 | 234 |
| Adj. ADG[5] | 2.04 | 1.69 | 1.65 | 1.65 | 1.77 | 1.66 |
| Av. type sc.[6] | 12.8 | 12.4 | 12.2 | 12.2 | 11.4 | 12.2 |
| Av. cond. sc.[6] | 9.9 | 8.2 | 8.4 | 8.6 | 8.3 | 8.2 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

[a]Calves older than 300 days when weighed, sick calves, calves raised by foster dams, and calves sold before weaning were not included.
[b]Artificial insemination and pasture.
[c]Artificial insemination.

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Tennessee State

| Location | Ames | Ames | Ames | Ames | | |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Angus | Angus | Angus | | |
| Breed of dam | Angus | Angus | Angus | Angus | | |
| Line or group[1] | 8660 | 8657 | 8500 | 8310 | | |
| No. cows exposed[2] | | | | | | |
| No. calves born[3] | 14 | 9 | 8 | 11 | | |
| Calving percent, born | | | | | | |
| Av. birth date | 3-07-63 | 3-17-63 | 4-19-63 | 3-16-63 | | |
| Av. birth wt. | 52 | 53 | 52 | 53 | | |
| No. calves weaned | 14 | 8 | 7 | 10 | | |
| Calving percent, weaned[4] | a | a | a | a | | |
| Av. weaning age, days | 227 | 217 | 184 | 218 | | |
| Adj. ADG[5] | 1.72 | 1.76 | 1.70 | 1.82 | | |
| Av. type sc.[6] | 12.1 | 12.2 | 10.8 | 12.5 | | |
| Av. cond. sc.[6] | 8.0 | 8.9 | 8.0 | 8.6 | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

[a]Calves older than 300 days when weighed, sick calves, calves raised by foster dams, and calves sold before weaning were not included.

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Tennessee State

| | | | | | | |
|---|---|---|---|---|---|---|
| Location | Greeneville | | | | | |
| Breed of sire | P.Hereford | | | | | |
| Breed of dam | P.Hereford | | | | | |
| Line or group[1] | | | | | | |
| Bulls: No. in group | | | | | | |
| Bulls: Av. init. age | | | | | | |
| Bulls: Av. init. wt. | | | | | | |
| Bulls: Av.no.da.fed | | | | | | |
| Bulls: Av. final wt. | | | | | | |
| Bulls: ADG on test | | | | | | |
| Bulls: Av. type sc. | | | | | | |
| Bulls: Av. cond. sc. | | | | | | |
| Bulls: Av. inbreeding | | | | | | |
| Heifers: No. in group | 11 | | | | | |
| Heifers: Av. init. age | 256 | | | | | |
| Heifers: Av. init. wt. | 442 | | | | | |
| Heifers: Av.no.da.fed | 210 | | | | | |
| Heifers: Av. final wt. | 772 | | | | | |
| Heifers: ADG on test | 1.57 | | | | | |
| Heifers: Av. type sc. | | | | | | |
| Heifers: Av. cond. sc. | 10.4 | | | | | |
| Heifers: Av. inbreeding | | | | | | |
| Steers: No. in group | | | | | | |
| Steers: Av. init. age | | | | | | |
| Steers: Av. init. wt. | | | | | | |
| Steers: Av.no.da.fed | | | | | | |
| Steers: Av. final wt. | | | | | | |
| Steers: ADG on test | | | | | | |
| Steers: Av. type sc. | | | | | | |
| Steers: Av. cond. sc. | | | | | | |
| Steers: Av. inbreeding | | | | | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | | | |
| Pounds/day over feeding period | | | |

Ration: Silage

FORM III
SLAUGHTER DATA, 1963

Tennessee State

| Location | Oak Ridge | Oak Ridge | Oak Ridge | Oak Ridge | Oak Ridge | Oak Ridge |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | Hereford | Hereford | Hereford | Hereford |
| Breed of dam | Hereford | Hereford | Hereford | Hereford | Hereford | Hereford |
| Line or group | 9513 | 9513 | 9513 | 9513 | 9034 | 9034 |
| Sex | Steer | Steer | Female[a] | Female[a] | Steer | Steer |
| Age at slaughter | 420 | 430 | 388 | 388 | 420 | 427 |
| No. slaughtered | 6[b] | 3[c] | 7[b] | 8[c] | 3[b] | 5[c] |
| Days in feedlot | 169 | 169 | 127 | 127 | 169 | 169 |
| Final feedlot weight | 820 | 835 | 655 | 656 | 799 | 842 |
| Slaughter wt., live | 815 | 835 | 666 | 665 | 798 | 839 |
| Carcass wt., cold | 462 | 477 | 369 | 379 | 446 | 477 |
| Dressing percent, cold | 57 | 57 | 55 | 57 | 56 | 57 |
| Carcass grade, quality | 9.7 | 9.3 | 11.8 | 10.2 | 9.0 | 9.6 |
| Carcass grade, cutability | | | | | | |
| Est. percent, kidney fat | 2.8 | 2.5 | 2.9 | 3.0 | 2.7 | 2.8 |
| Rib-eye area/100 lbs. carc. (sq. in.) | | | | | | |
| Marbling score, USDA | | | | | | |
| Fat thickness over ribeye(in.)[1] | | | | | | |
| W-B shear force, lbs.[2] | | | | | | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

[a]Replacement females not included in carcass data.
[b]No creep.
[c]Creep fed.

FORM III
SLAUGHTER DATA, 1963

Tennessee State

| Location | Oak Ridge | Oak Ridge | Oak Ridge | Oak Ridge | | |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | Hereford | Hereford | | |
| Breed of dam | Hereford | Hereford | Hereford | Hereford | | |
| Line or group | 2196 | 2196 | 2196 | 2196 | | |
| Sex | Steer | Steer | Female[a] | Female[a] | | |
| Age at slaughter | 420 | 440 | 388 | 392 | | |
| No. slaughtered | 6[b] | 6[c] | 6[b] | 5[c] | | |
| Days in feedlot | 169 | 169 | 127 | 127 | | |
| Final feedlot weight | 836 | 901 | 665 | 636 | | |
| Slaughter wt., live | 832 | 898 | 700 | | | |
| Carcass wt., cold | 468 | 515 | 401 | | | |
| Dressing percent, cold | 56 | 57 | 57 | | | |
| Carcass grade, quality | 9.5 | 9.8 | 10.7 | | | |
| Carcass grade, cutability | | | | | | |
| Est. percent, kidney fat | 2.4 | 2.6 | 3.2 | | | |
| Rib-eye area/100 lbs. car.(sq.in.) | | | | | | |
| Marbling score, USDA | | | | | | |
| Fat thickness over ribeye(in.) | | | | | | |
| W-B shear force, lbs. | | | | | | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

[a]Replacement females not included in carcass data.
[b]No creep.
[c]Creep.

FORM III
SLAUGHTER DATA, 1963

Tennessee State

| Location | Oak Ridge | Oak Ridge | Oak Ridge | Oak Ridge | Oak Ridge | Oak Ridge |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | Hereford | Hereford | Hereford | Hereford |
| Breed of dam | Hereford | Hereford | Hereford | Hereford | Hereford | Hereford |
| Line or group | 9034 | 9034 | 6079 | 6079 | 6079 | 6079 |
| Sex | Female[a] | Female[a] | Steer | Steer | Female[a] | Female[a] |
| Age at slaughter | 385 | 386 | 426 | 406 | 370 | 393 |
| No. slaughtered | 7[b] | 8[c] | 8[b] | 5[c] | 3[b] | 5[c] |
| Days in feedlot | 127 | 127 | 169 | 169 | 127 | 127 |
| Final feedlot weight | 653 | 655 | 851 | 783 | 625 | 659 |
| Slaughter wt., live | 665 | 662 | 850 | 781 | 610 | 687 |
| Carcass wt., cold | 378 | 374 | 479 | 444 | 341 | 397 |
| Dressing percent, cold | 57 | 56 | 56 | 57 | 56 | 58 |
| Carcass grade, quality | 10.5 | 11.0 | 9.4 | 9.4 | 9.5 | 11.7 |
| Carcass grade, cutability | | | | | | |
| Est. percent, kidney fat | 3.0 | 2.6 | 2.7 | 2.5 | 2.8 | 2.8 |
| Rib-eye area/100 lbs.car.(sq.in.) | | | | | | |
| Marbling score, USDA | | | | | | |
| Fat thickness over ribeye(in.)[1] | | | | | | |
| W-B shear force, lbs.[2] | | | | | | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

[a]Replacement females not included in carcass data.
[b]No creep.
[c]Creep fed.

FORM III
SLAUGHTER DATA, 1963

Tennessee State

| Location | Greeneville | Greeneville | Greeneville | | | |
|---|---|---|---|---|---|---|
| Breed of sire | P.Hereford | P.Hereford | P.Hereford | | | |
| Breed of dam | P.Hereford | P.Hereford | P.Hereford | | | |
| Line or group | 99 | 279 | 868 | | | |
| Sex | Female | Female | Female | | | |
| Age at slaughter | 466 | 461 | 472 | | | |
| No. slaughtered | 6 | 3 | 2 | | | |
| Days in feedlot | 210 | 210 | 210 | | | |
| Final feedlot weight | 758 | 816 | 750 | | | |
| Slaughter weight, live | 728 | 792 | 710 | | | |
| Carcass wt., cold | | | | | | |
| Dressing percent, cold | | | | | | |
| Carcass grade, quality | 11.0 | 9.3 | 11.0 | | | |
| Carcass grade, cutability | | | | | | |
| Est. percent, kidney fat | 3.4 | 3.2 | 3.2 | | | |
| Rib-eye area/100 lbs.car.(sq.in.) | | | | | | |
| Marbling score, USDA | | | | | | |
| Fat thickness over ribeye(in.)[1] | | | | | | |
| W-B shear force, lbs.[2] | | | | | | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

TEXAS A AND M UNIVERSITY
Agricultural Experiment Station

I. PROJECT: Animal Husbandry 650, AHRD Line Project dl-22 (S-10)

The Improvement of Production and Desirability of Beef Through Breeding Methods

II. OBJECTIVES:

To estimate and further test by selection and breeding, genetic parameters including heritability, heterotic effect, and genetic correlations for:

1 - weaning weight
2 - postweaning feedlot and pasture gain
3 - gain during the summer months
4 - beef value of the carcass, including distribution of carcass weight among various cuts and muscle, fat, and bone
5 - eating desirability of the beef
6 - other characteristics as their possible importance becomes evident.

To test breeds and strains of unknown or unrecorded productivity.

To develop procedures and techniques adequate for practical application in:

1 - record keeping
2 - artificial insemination
3 - other areas involved in management that present an obvious need in a breeding program.

To determine factors influencing milk production of beef cows and its relation to growth rate and weaning weight of their calves by:

1 - developing reliable methods for accurate estimation of the milk production of beef cows under practical conditions.
2 - establishing the degree of variability in production and composition of milk among individual beef cows of different ages and sizes and among the several breeds and crosses.
3 - determining the influence of quantity and composition of milk consumed upon growth rate and weaning weight of beef calves.
4 - determining the influence of advancing stage of lactation and age upon milk production of the same beef cows maintained on pasture, as compared with similar cows fed a standard ration of silage and supplement in drylot.
5 - determining the influence of level of energy supplementation upon milk production of beef cows maintained on pasture and in the drylot.

III. PERSONNEL:

T. C. Cartwright, R. J. Cooper, W. E. Kruse, J. K. Riggs, and H. O. Hill.

IV. ACCOMPLISHMENTS DURING THE YEAR:

Total retail value and retail value per cwt. were estimated for 257 beef carcasses from weights of retail cuts (major cuts on a boneless basis) and calculated values of each cut. The retail values of most cuts were determined from five-year average prices for choice and good wholesale cuts and from the average retail yield of the various wholesale cuts. The carcasses were from 10 breed-year-experiment lots. Group A consisted of 5 lots (168 head) of cattle ranging in carcass grade from high-standard to low-prime, with 45 percent grading low-choice or higher. Group B consisted of 5 lots in which carcass grade ranged from low-standard to high-good. Pooled intra-lot correlations between chilled carcass weight and total retail value were 0.92 and 0.94, and between chilled carcass weight and retail value they were -0.22 and -0.37 for groups A and B, respectively. Multiple regression analyses revealed that the inclusion of additional weights or measurements in the set of independent variables reduced the sum of squares of deviations from regression by essentially the same proportion when either total carcass value or retail value per cwt. was regressed on chilled carcass weight. Also, the standard errors of estimate for the regression of total retail value on carcass weight, when divided by the average carcass weight of each lot were essentially the same as the standard errors of estimate for the regression of total retail value per cwt. on carcass weight. Therefore, the conclusion was made that in these data a correlation of carcass weight with total retail value of 0.92 was of no more practical importance than a correlation of 0.22 with retail value per cwt. Carcass composition appeared as important or more important than carcass grade in determining retail value when only price differential due to carcass grade was below low-choice. In three of five lots in group A, the standard partial regression coefficients were larger for yield grade than for carcass grade when the multiple regression of retail value per cwt. on carcass grade and yield grade was calculated. Some of the intra-lot correlations with retail value per cwt. for groups A and B were: percent primal wholesale cuts, 0.43 and 0.83; percent wholesale round, 0.27 and 0.66; percent major boneless cuts, 0.71 and 0.96; percent boneless round and rump, 0.43 and 0.81; percent boneless loin, 0.63 and 0.67; carcass weight and weights of each of the major boneless cuts, 0.80 and 0.98; carcass grade, 0.32 and -0.37; and carcass weight, single fat thickness over rib eye, rib-eye area, and weight of kidney and pelvic fat, 0.49 and 0.78.

Data on cows and their calves collected at the Lufkin station over a 14-year period on Hereford, Brahman, and Hereford-Brahman crosses were analyzed. Weights of all cows and calves were recorded every month. Main effects considered for analyses of dam weight and calf weight, ranked according to their reduction in mean squares were:

Dam weights (av. 12 wts.)

1. Breed or cross
2. Previous parity
3. Age of cow
4. Year calf weaned
5. Month calf born
6. Sex of calf
7. Weight of calf

Calf weights

1. Sex of calf
2. Age of calf
3. Breed or cross
4. Year calf weaned
5. Month of birth
6. Age of dam
7. Av. weight of dam
8. Previous parity of dam

Analyses of cow weights taken either 30 to 60 days before, 60 to 90 days after, or 180 to 210 days after calving indicated that the effects considered were similar for each analysis, with two exceptions. Year effects assumed more importance in influencing cow weights taken when calves were old enough to be weaned (180 to 210 days) than when the calves were younger. Month of birth was apparently a much more important consideration for cow weights taken 60 to 90 days after calving than at either of the other two times. There were only minor changes in analyses of calf weights as different dam weights were used.

Analyses of calf weights were not significantly less efficient when either weight of dam was deleted or age of dam was reduced to only two categories: (1) first-calf heifers, and (2) older cows. In addition, the state of parity of the dam the previous year did not contribute significantly.

Comparisons of constants indicated that presently recommended correction factors of the Texas Agricultural Extension Service are adequate except that age effects and weight effects are, to a degree, one and the same so that age of dam corrections tend to favor large, but not necessarily more efficient, dams.

Constants from calf weight analyses indicated a rather uniform increase in average calf weight as dam weight increased up to about 1050 lbs., then were substantially level up to 1300 lbs., and decreased slightly up to 1350 lbs. Constants from dam weight analyses indicated that dam weight increased as calf weight increased, but dam weight increase was erratic. It appears that weaning weight selection would be more efficient if dam weight was taken into consideration. Continued research appears well justified, especially with regard to composition of cow weight and correlation of mature weight to gain ability.

Production of milk, butterfat, solids-non-fat, and total solids were estimated for 10 Hereford cows by milking and by nursing methods at intervals of 4, 6, 8, 12, 17, and 24 hours during 24-hour periods. Both methods indicated that the 17 and 24-hour intervals yielded the lowest amounts of milk. One milking after 17 hours yielded approximately 60 percent of the quantity obtained by more frequent milkings similar to normal calf nursing.

Yield and composition of milk were estimated for 16 groups of cows in nine herds scattered from the Gulf Coast to the Rolling Plains. Most of these cows were milked only one time an average of 17 hours after nurse-out. Angus, Brahman, Brahman x Hereford, Charbray, Hereford, Santa Gertrudis, and Shorthorn cows were involved. The mean yield for 362 cows, corrected to a 24-hour basis, was 11.5 lbs. Large variations were found in individual milk yields within herds, breeds, and crosses. Percent butterfat was also widely variable, but percent solids-not-fat was quite stable under all circumstances. Effect of stage of lactation was not clearly demonstrated. Milk yield was definitely related to age of cow, but the data are considered biased in favor of the older groups because of culling level which may differ in herds.

Weight of cow did not significantly affect either milk yield or composition. However, breed and cross influenced both yield and composition of milk. The effect of heterosis in Brahman-Hereford first-cross cows was clearly manifested in milk yield and was reflected in calf weaning weight. The only correlation of consequence was between milk yield and calf weight. Percent composition of milk had little, if any, effect on calf weight, although there was a closer relationship between yield of milk solids and calf weight.

Calves self-fed hay and hand-fed milk from birth to 203 days of age at levels of 5, 7, and 10 percent of body weight per day showed significant differences in weight gain, weight per day of age, and 205-day weaning weight. As milk consumption increased the weights increased. Level of butterfat (3, 4, and 5 percent) in the milk fed at a level of 10 percent of body weight per day did not significantly affect calf growth. Flesh of calves at weaning appeared to be related to level of milk intake, but not to level of butterfat in the milk. Milk production appears definitely to be a useful aid in selection, and satisfactory methods for estimating milk production have been developed.

Completion of the third year of evaluating the maximum production groups continues to indicate the feasibility of producing 1000-pound calves in a year or less. The average weight of the steers at 365 days of age was 963 pounds this year, versus 973 last year. Some breed groups exceeded 1000 pounds at one year. Approximately half graded USDA Good; one-fourth. Choice; and one-fourth, Standard. Shears of one-half inch cores ranged from 7 lbs. to 17 lbs., and averaged 11 lbs. The goal of producing 1000-pound calves at weaning is probably several generations in the future. These results appear to have the potential of making a very substantial impact on the beef producing industry.

Sets of selection indexes constructed for Hereford, Brahman, Santa Gertrudis, and several Hereford-Brahman breeding types considering birth weight, weaning weight, and feedlot gain at varying levels of relative economic importance indicate that separate selection indexes should be constructed for the different breed types. If feedlot gain is available, the addition of birth weight adds little to accuracy except for Brahmans. There was no indication of a need to use separate indexes for the different sexes. A large number of other indexes have been computed from estimates of $h^2$, etc., reported in the literature.

Carcass data from 152 Hereford steers, varying in age at slaughter from 369 to 540 days, were analyzed. USDA carcass grades ranged from low-Standard to high-Choice, with the majority being Good.

Relationships between the carcass variables - fat thickness at the 12th rib, l. dorsi area at the 12th rib, kidney and pelvic fat weight, carcass weight, and boneless roast and steak meat - were determined by simple and partial correlation coefficients. Multiple regression prediction equations for weight of the roast and steak meat, using the other carcass measurements as independent variables, were calculated from the same data.

All of the relationships between the carcass variables, as determined by simple correlations, were positive and significant. Partial correlations with carcass weight held constant disclosed significant negative relationships between the measurements of carcass fat, kidney fat weight, and fat thickness and either l. dorsi area or roast and steak meat. Although the partial correlations between l. dorsi area and the weight of the boneless, trimmed loin, rib, or round were significant and positive, l. dorsi area was negatively related to the weight of the chuck. A canceling effect which would partially explain the nonsignificant relationship between l. dorsi area and the weight of the roast and steak meat when carcass weight was held constant was suggested.

Carcass weight alone accounted for more of the variation in carcass roast and steak meat than any combination of the other carcass variables. An equation containing kidney fat weight and carcass weight accounted for 90 percent of the variation in the dependent variable. Equations containing a measure of fat thickness and carcass weight accounted for over 83 percent of the variation in roast and steak meat. The ease and accuracy with which fat thickness may be determined, in comparison with kidney fat weight, might make the second equation more applicable for general usage.

## V. FUTURE PLANS:

Data collection and analysis will continue. More emphasis will be placed on determining the importance of mature weight and its relationship to production. Continued emphasis will be given to the relative importance of carcass weight per day of age and carcass composition. Evaluation of efficiency and maximum production will continue. Additional emphasis will be given to evaluating Charolais and Brown Swiss for beef production in breeding programs utilizing only additive genetic variance in selection and in those utilizing non-additive genetic variance.

## VI. PUBLICATIONS DURING THE YEAR:

Cartwright, T. C., G. F. Ellis, Jr., W. E. Kruse, and E. K. Crouch. 1964. Hybrid vigor in Brahman-Hereford crosses. Texas Agricultural Experiment Station, Technical Monograph No. 1.

Chow, G. 1964. The influence of frequency of milking and nursing upon 24-hour milk production of Hereford cows. Master's Thesis, Texas A and M University, College Station, Texas.

Ellis, G. F., Jr. 1963. A biometrical evaluation of heterosis in beef cattle. Ph.D. Dissertation. Texas A and M University, College Station, Texas.

Ellis, G. F., Jr., and T. C. Cartwright. 1963. Heterosis in Brahman-Hereford crosses. J. Animal Sci. 22:817 (abs.).

Fitzhugh, H. A., Jr. 1963. Methods of predicting the weight of carcass roast and steak meat from easily obtainable carcass measurements. Master's Thesis, Texas A and M University, College Station, Texas.

Klett, R. H. 1963. Quantity and quality of milk produced by beef cows in selected herds in Texas. Master's Thesis, Texas A and M University, College Station, Texas.

Kruse, W. E. 1964. 1963-1964 beef cattle gain performance test, McGregor. Texas Agr. Expt. Station, MP-686.

Lagos, F., and T. C. Cartwright. 1963. Sire-environmental interaction of gain in cattle. J. Animal Sci. 22:820 (abs.).

Maddox, L. A., Jr., 1964. Factors affecting calf and dam weights and their effects on breeding programs. Master's Thesis, Texas A and M University, College Station, Texas.

Mason, T. R. 1963. Quantity and quality of milk produced by beef cows as related to weaning weights of their calves. Ph.D. Dissertation, Texas A and M University, College Station, Texas.

Miquel, C. A., and T. C. Cartwright. 1963. Comparison of heritabilities in crossbred and purebred cattle. J. Animal Sci. 22:821 (abs.).

Sanfiorenzo, J. H. 1963. Comparison of selection indexes constructed for widely different beef cattle types. Ph.D. Dissertation, Texas A and M University, College Station, Texas.

VII. PUBLICATIONS PLANNED:

Cooper, R. J., O. D. Butler, G. T. King, and others. Relative importance of carcass weight and carcass composition in determining the value of beef carcasses. In preparation for publication as a technical bulletin or article.

Fitzhugh, H. A., Jr., G. T. King, F. A. Orts, Z. L. Carpenter, and O. D. Butler. 1964. Methods of predicting the weight of boneless roast and steak meat from easily obtained beef carcass measurements. J. Animal Sci. (in press).

Submitted by T. C. Cartwright

## CATTLE BREED AND CROSS CODE

| Breed Code | Breed |
|---|---|
| A | Angus |
| B | Brahman |
| BS | Brown Swiss |
| C | Charbray |
| G | Santa Gertrudis |
| H | Hereford |
| L | Charolais |
| R | Red Poll |

| Cross Code | | Dam Breed | | Sire Breed |
|---|---|---|---|---|
| 1x | = | H | - | B |
| 2x | = | B | - | H |
| 3x | = | 1x | - | H |
| 4x | = | 1x | - | B |
| 5x | = | 3x,9x | - | H |
| 9x | = | H | - | 1x |
| 10x | = | 3x,5x,9x | - | L |
| 11x | = | H | - | G |
| 13x | = | 1x | - | G |
| 14x | = | 1x | - | R |
| 15x | = | H | - | L |
| 16x | = | 1x | - | L |
| 23x | = | 4x | - | B |
| 24x | = | 23x | - | B |
| 32x | = | 11x | - | G |
| 33x | = | 32x | - | G |
| 36x | = | B | - | C |
| 42x | = | 13x | - | G |
| 51x | = | R | - | G |
| 52x | = | 51x | - | G |
| 53x | = | 52x | - | G |
| 61x | = | 14x | - | G |
| 62x | = | 61x | - | G |
| 66x | = | 1x | - | C |
| 72x | = | 15x | - | L |
| 76x | = | 3x,5x,9x | - | C |
| 81x | = | 16x | - | C |
| 82x | = | 16x | - | L |

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Texas State

| Location | McGregor | McGregor | McGregor | McGregor | McGregor | McGregor |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Brahman | Hereford | BrownSwiss | BrownSwiss | Charolais |
| Breed of dam | Angus | Brahman | Hereford | Hereford | 1x | Charbray |
| Line or group[1] | Purebred | Purebred | Purebred and grade | Grade | Crossbred | Purebred |
| No. cows exposed[2] | 24 | 38 | 156 | 2 | 28 | 39 |
| No. calves born[3] | 23 | 25 | 136 | 2 | 26 | 23 |
| Calving percent, born | 95.8 | 65.8 | 86.5 | 100.0 | 92.9 | 59.0 |
| Av. birth date | 2-01-63 | 2-04-63 | 1-29-63 | 1-09-63 | 12-04-62 | 1-29-63 |
| Av. birth wt. | 63.6 | 64.2 | 69.3 | 76.0 | 75.6 | 84.4 |
| No. calves weaned | 21 | 18 | 125 | 2 | 25 | 18 |
| Calving percent, weaned[4] | 95.8 | 47.4 | 79.5 | 100.0 | 89.3 | 46.2 |
| Av. weaning age, days | 180 | 180 | 180 | 180 | 180 | 180 |
| Adj. ADG[5] | 2.02 | 2.03 | 1.99 | 2.02 | 2.54 | 2.49 |
| Av. type sc.[6] | | | | | | |
| Av. cond. sc.[6] | | | | | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd. (This includes yearling heifers.)
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

No adjustments, figured on the 180-day weaning weight.

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Texas State

| Location | McGregor | McGregor | McGregor | McGregor | McGregor | McGregor |
|---|---|---|---|---|---|---|
| Breed of sire | Charolais | Charolais | Charolais | Charolais | Charolais | Charolais |
| Breed of dam | 15x | 16x | 36x | 66x | 72x | 76x |
| Line or group[1] | Crossbred | Crossbred | Crossbred | Crossbred | Crossbred | Crossbred |
| No. cows exposed[2] | 3 | 9 | 2 | 7 | 3 | 4 |
| No. calves born[3] | 3 | 8 | 1 | 5 | 0 | 2 |
| Calving percent, born | 100.0 | 88.9 | 50.0 | 71.4 | | 50.0 |
| Av. birth date | 2-16-63 | 12-28-62 | 12-15-62 | 1-18-63 | | 2-01-63 |
| Av. birth wt. | 76.7 | 81.4 | 88.0 | 73.0 | | 77.0 |
| No. calves weaned[4] | 3 | 7 | 1 | 5 | | 2 |
| Av. weaning age, days | 180 | 180 | 180 | 180 | | 180 |
| Adj. ADG[5] | 1.93 | 2.67 | 2.94 | 2.55 | | 2.06 |
| Av. type sc.[6] | | | | | | |
| Av. cond. sc.[6] | | | | | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd. (Includes yearling heifers.)
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

No adjustments, figured on 180-day weaning weight

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Texas State

| Location | McGregor | McGregor | McGregor | McGregor | McGregor | McGregor |
|---|---|---|---|---|---|---|
| Breed of sire | Charolais | Charolais | Charolais | Charolais | Charolais | Charolais |
| Breed of dam | 10x | 81x | 82x | 1x | 13x | 3x |
| Line or group[1] | Crossbred | Crossbred | Crossbred | Crossbred | Crossbred | Crossbred |
| No. cows exposed[2] | 4 | 1 | 2 | 9 | 3 | 4 |
| No. calves born[3] | 2 | 0 | 1 | 7 | 1 | 3 |
| Calving percent, born | 50.0 | | 50.0 | 77.8 | 33.3 | 75.0 |
| Av. birth date | 12-01-62 | | 1-11-63 | 1-16-63 | 2-26-63 | 2-10-63 |
| Av. birth wt. | 79.0 | | 22.0 | 71.7 | 86.0 | 75.0 |
| No. calves weaned | 2 | | 0 | 6 | 1 | 3 |
| Calving percent, weaned[4] | 50 | | | 66.7 | 33.3 | 75.0 |
| Av. weaning age, days | 180 | | | 180 | 180 | 180 |
| Adj. ADG[5] | 2.88 | | | 2.37 | 2.52 | 2.40 |
| Av. type sc.[6] | | | | | | |
| Av. cond. sc.[6] | | | | | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd. (Includes yearling heifers)
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

No adjustment - figured on 180 day weaning weight

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Texas State

| Location | McGregor | McGregor | McGregor | McGregor | McGregor | McGregor |
|---|---|---|---|---|---|---|
| Breed of sire | Charbray | Charbray | Charbray | Charbray | Charbray | Charbray |
| Breed of dam | Charbray | 1x | 2x | 9x | 3x | 13x |
| Line or group[1] | Crossbred | Crossbred | Crossbred | Crossbred | Crossbred | Crossbred |
| No. cows exposed[2] | 3 | 13 | 1 | 5 | 3 | 4 |
| No. calves born[3] | 2 | 12 | 1 | 5 | 3 | 2 |
| Calving percent, born | 66.7 | 92.3 | 100.0 | 100.0 | 100.0 | 50.0 |
| Av. birth date | 2-10-63 | 12-10-62 | 12-03-62 | 12-03-62 | 11-28-62 | 12-23-62 |
| Av. birth wt. | 85.0 | 85.3 | 87.0 | 78.0 | 77.5 | 80.0 |
| No. calves weaned | 2 | 11 | 1 | 5 | 3 | 1 |
| Calving percent, weaned[4] | 66.7 | 84.6 | 100.0 | 100.0 | 100.0 | 25.0 |
| Av. weaning age, days | 180 | 180 | 180 | 180 | 180 | 180 |
| Adj. ADG[5] | 2.65 | 2.61 | 2.83 | 2.27 | 2.29 | 3.32 |
| Av. type sc.[6] | | | | | | |
| Av. cond. sc.[6] | | | | | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd. (Includes yearling heifers)
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

No adjustments - figured on 180-day weaning weight

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Texas State

| Location | McGregor | McGregor | McGregor | McGregor | McGregor | McGregor |
|---|---|---|---|---|---|---|
| Breed of sire | S. Gert. | S. Gert. | S. Gert. | S. Gert. | S. Gert. | S. Gert. |
| Breed of dam | Red Poll | 11x | 32x | 33x | 42x | 51x |
| Line or group[1] | Crossbred | Crossbred | Crossbred | Crossbred | Crossbred | Crossbred |
| No. cows exposed[2] | 3 | 20 | 25 | 4 | 7 | 12 |
| No. calves born[3] | 1 | 20 | 20 | 4 | 5 | 7 |
| Calving percent, born | 33.3 | 100.0 | 80.0 | 100.0 | 71.4 | 58.3 |
| Av. birth date | 2-13-63 | 1-09-63 | 2-14-63 | 2-16-63 | 2-16-63 | 3-04-63 |
| Av. birth wt. | 96.0 | 77.6 | 74.0 | 74.0 | 81.2 | 82.9 |
| No. calves weaned | 1 | 18 | 18 | 3 | 4 | 6 |
| Calving percent, weaned[4] | 33.3 | 90.0 | 72.0 | 75.0 | 57.1 | 50.0 |
| Av. weaning age, days | 180 | 180 | 180 | 180 | 180 | 180 |
| Adj. ADG[5] | 2.29 | 2.38 | 2.20 | 2.18 | 2.54 | 2.24 |
| Av. type sc.[6] | | | | | | |
| Av. cond. sc.[6] | | | | | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd. (Includes yearling heifers)
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

No adjustment - figured on 180-day weaning weight

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Texas State

| Location | McGregor | McGregor | McGregor | McGregor | McGregor | McGregor |
|---|---|---|---|---|---|---|
| Breed of sire | S. Gert. | S. Gert. | S. Gert. | S. Gert. | Brahman | Brahman |
| Breed of dam | 52x | 53x | 61x | 62x | 4x | 7x |
| Line or group[1] | Crossbred | Crossbred | Crossbred | Crossbred | Crossbred | Crossbred |
| No. cows exposed[2] | 3 | 1 | 3 | 2 | 16 | 1 |
| No. calves born[3] | 2 | 1 | 3 | 2 | 11 | 1 |
| Calving percent, born | 66.7 | 100.0 | 100.0 | 100.0 | 68.8 | 100.0 |
| Av. birth date | 2-12-63 | 2-27-63 | 2-02-63 | 3-02-63 | 1-13-63 | 2-02-63 |
| Av. birth wt. | 66.6 | 70.0 | 69.0 | 89.0 | 72.2 | 69.5 |
| No. calves weaned | 2 | 1 | 2 | 2 | 10 | 0 |
| Calving percent, weaned[4] | 66.7 | 100.0 | 66.7 | 100.0 | 62.5 | |
| Av. weaning age, days | 180 | 180 | 180 | 180 | 180 | |
| Adj. ADG[5] | 1.72 | 2.41 | 2.79 | 2.53 | 2.09 | |
| Av. type sc.[6] | | | | | | |
| Av. cond. sc.[6] | | | | | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd. (Includes yearling heifers)
3 - Total number born, dead + alive
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

No adjustment - figured on 180-day weaning weight

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Texas State

| Location | McGregor | McGregor | | | | |
|---|---|---|---|---|---|---|
| Breed of sire | Brahman | Brahman | | | | |
| Breed of dam | 23x | 24x | | | | |
| Line or group[1] | Crossbred | Crossbred | | | | |
| No. cows exposed | 20 | 4 | | | | |
| No. calves born[3] | 12 | 1 | | | | |
| Calving percent, born | 60.0 | 25.0 | | | | |
| Av. birth date | 2-24-63 | 2-27-63 | | | | |
| Av. birth wt. | 69.1 | 60.0 | | | | |
| No. calves weaned | 11 | 1 | | | | |
| Calving percent, weaned[4] | 55.0 | 25.0 | | | | |
| Av. weaning age, days | 180 | 180 | | | | |
| Adj. ADG[5] | 2.09 | 2.04 | | | | |
| Av. type sc.[6] | | | | | | |
| Av. cond. sc.[6] | | | | | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd. (Includes yearling heifers)
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

No adjustments - figured on 180-day weaning weight

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Texas State

| | Location | McGregor | McGregor | McGregor | McGregor | McGregor | McGregor |
|---|---|---|---|---|---|---|---|
| | Breed of sire | Hereford | Hereford | Angus | Brahman | Charolais | Charbray |
| | Breed of dam | Hereford | Hereford | Angus | Brahman | Charolais | Charbray |
| | Line or group[1] | Purebred | Purebred | Purebred | Purebred | Purebred | Purebred |
| Bulls | No. in group | 5[a] | 26[a] | 9 | 6 | 3 | 2 |
| | Av. init. age | 313 | 278 | 267 | 269 | 294 | 271 |
| | Av. init. wt. | 726 | 558 | 536 | 547 | 781 | 707 |
| | Av.no.da.fed | 140 | 140 | 140 | 140 | 140 | 140 |
| | Av. final wt. | 1067 | 948 | 887 | 888 | 1226 | 1201 |
| | ADG on test | 2.4 | 2.8 | 2.5 | 2.5 | 3.2 | 3.6 |
| | Av. type sc. | | | | | | |
| | Av. cond. sc.[b] | 65 | 67 | 64 | 58 | 61 | 60 |
| | Av. inbreeding | | | | | | |
| Heifers | No. in group | | 10 | | | | |
| | Av. init. age | | 256 | | | | |
| | Av. init. wt. | | 450 | | | | |
| | Av.no.da.fed | | 140 | | | | |
| | Av. final wt. | | 770 | | | | |
| | ADG on test | | 2.3 | | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc.[b] | | 59 | | | | |
| | Av. inbreeding | | | | | | |
| Steers | No. in group | | 21 | 2 | | | |
| | Av. init. age | | 272 | 252 | | | |
| | Av. init. wt. | | 478 | 419 | | | |
| | Av.no.da.fed | | 140 | 140 | | | |
| | Av. final wt. | | 806 | 673 | | | |
| | ADG on test | | 2.4 | 1.9 | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc.[b] | | 60 | 65 | | | |
| | Av. inbreeding | | | | | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

[a]Cooperator owned

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full Limited, etc. | Full-fed | Full-fed | Full-fed |
| Pounds/day over Feeding period | 21.9 | 19.2 | 20.7 |

Ration: All cattle fed the same ration.
30% ground grain sorghum
10% cottonseed meal
10% ground oats
50% ground sudan hay
Fortified with 1000 USP units Vit. A concentrate/lb. mixed feed

[b]Condition code (Av. of three judges):
10-30 = thin
40-60 = medium
70-90 = fat

# FORM II
# POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Texas State

| | Location | McGregor | McGregor | McGregor | McGregor | McGregor | McGregor |
|---|---|---|---|---|---|---|---|
| | Breed of sire | S. Gert | B. Swiss | Brahman | S. Gert. | S. Cert. | Charbray |
| | Breed of dam | S. Gert. | B. Swiss | 4x | Red Poll | 14x | 3x+9x |
| | Line or group[1] | Purebred | Purebred | Crossbred | Crossbred | Crossbred | Crossbred |
| Bulls | No. in group | 2 | 3 | | | | |
| | Av. init. age | 234 | 355 | | | | |
| | Av. init. wt. | 518 | 675 | | | | |
| | Av.no.da.fed | 140 | 140 | | | | |
| | Av. final wt. | 905 | 1085 | | | | |
| | ADG on test | 2.8 | 2.9 | | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc.[a] | 63 | 57 | | | | |
| | Av. inbreeding | | | | | | |
| Heifers | No. in group | | | 3 | 1 | 1 | 6 |
| | Av. init. age | | | 290 | 237 | 317 | 284 |
| | Av. init. wt. | | | 508 | 465 | 664 | 532 |
| | Av.no.da.fed | | | 140 | 140 | 140 | 140 |
| | Av. final wt. | | | 780 | 774 | 997 | 854 |
| | ADG on test | | | 1.9 | 2.2 | 2.4 | 2.3 |
| | Av. type sc. | | | | | | |
| | Av. cond. sc.[a] | | | 55 | 50 | 73 | 61 |
| | Av. inbreeding | | | | | | |
| Steers | No. in group | | | 1 | | 1 | 3 |
| | Av. init. age | | | 194 | | 228 | 315 |
| | Av. init. wt. | | | 422 | | 606 | 670 |
| | Av.no.da.fed | | | 140 | | 140 | 140 |
| | Av. final wt. | | | 706 | | 900 | 994 |
| | ADG on test | | | 2.0 | | 2.1 | 2.3 |
| | Av. type sc. | | | | | | |
| | Av. cond. sc.[a] | | | 47 | | 57 | 66 |
| | Av. inbreeding | | | | | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | Full-fed | Full-fed | Full-fed |
| Pounds/day over feeding period | | | |

All cattle fed the same ration.

Ration:
30% ground grain sorghum
10% cottonseed meal
10% ground oats
50% ground sudan hay
Fortified with 1000 USP units Vit. A concentrate/lb. mixed feed

[a]Condition code (av. of three judges):
10-30 = thin
40-60 = medium
70-90 = fat

# FORM II
# POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Texas State

| Location | | McGregor | McGregor | McGregor | McGregor | McGregor | McGregor |
|---|---|---|---|---|---|---|---|
| Breed of sire | | Brahman | Brahman | S. Gert. | S. Gert. | S. Gert. | S. Gert. |
| Breed of dam | | 23x | 24x | 11x | 32x | 42x | 51x |
| Line or group[1] | | Crossbred | Crossbred | Crossbred | Crossbred | Crossbred | Crossbred |
| Bulls | No. in group | | | | | | |
| | Av. init. age | | | | | | |
| | Av. init. wt. | | | | | | |
| | Av.no.da.fed | | | | | | |
| | Av. final wt. | | | | | | |
| | ADG on test | | | | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | | | | | | |
| | Av. inbreeding | | | | | | |
| Heifers | No. in group | | | | | | |
| | Av. init. age | | | | | | |
| | Av. init. wt. | | | | | | |
| | Av.no.da.fed | | | | | | |
| | Av. final wt. | | | | | | |
| | ADG on test | | | | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | | | | | | |
| | Av. inbreeding | | | | | | |
| Steers | No. in group | 5 | 1 | 6 | 6 | 2 | 4 |
| | Av. init. age | 246 | 223 | 252 | 231 | 227 | 222 |
| | Av. init. wt. | 536 | 482 | 575 | 472 | 685 | 504 |
| | Av.no.da.fed | 140 | 140 | 140 | 140 | 140 | 140 |
| | Av. final wt. | 836 | 791 | 884 | 797 | 1104 | 851 |
| | ADG on test | 2.1 | 2.2 | 2.2 | 2.3 | 3.0 | 2.6 |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | 54 | 53 | 63 | 56 | 69 | 57 |
| | Av. inbreeding | | | | | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | | | Full-fed |
| Pounds/day over feeding period | | | |
| | All cattle fed the same ration. | | |
| Ration: | 30% ground grain sorghum<br>10% cottonseed meal<br>10% ground oats<br>50% ground sudan hay<br>Fortified with 1000 USP units Vit. A concentrate/lb. mixed feed | | |

[a]Condition code (av. of three judges):
10-30 = thin
40-60 = medium
70-90 = fat

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Texas State

| Location | | McGregor | McGregor | McGregor | McGregor | McGregor | McGregor |
|---|---|---|---|---|---|---|---|
| Breed of sire | | S. Gert. | S. Gert. | Hereford | Charolais | Charolais | Charbray |
| Breed of dam | | 52x | 61x | Charbray | 10x | 16x | 13x |
| Line or group[1] | | Crossbred | Crossbred | Crossbred | Crossbred | Crossbred | Crossbred |
| Bulls | No. in group | | | | | | |
| | Av. init. age | | | | | | |
| | Av. init. wt. | | | | | | |
| | Av.no.da.fed | | | | | | |
| | Av. final wt. | | | | | | |
| | ADG on test | | | | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | | | | | | |
| | Av. inbreeding | | | | | | |
| Heifers | No. in group | | | | | | |
| | Av. init. age | | | | | | |
| | Av. init. wt. | | | | | | |
| | Av.no.da.fed | | | | | | |
| | Av. final wt. | | | | | | |
| | ADG on test | | | | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | | | | | | |
| | Av. inbreeding | | | | | | |
| Steers | No. in group | 1 | 1 | 3 | 1 | 1 | 1 |
| | Av. init. age | 234 | 204 | 246 | 313 | 328 | 224 |
| | Av. init. wt. | 378 | 513 | 492 | 728 | 758 | 546 |
| | Av.no.da.fed | 140 | 140 | 140 | 140 | 140 | 140 |
| | Av. final wt. | 687 | 842 | 804 | 1011 | 950 | 903 |
| | ADG on test | 2.2 | 2.4 | 2.2 | 2.0 | 1.4 | 2.6 |
| | Av. type sc. | | | | | | |
| | Av. cond. sc. | 43 | 57 | 59 | 60 | 57 | 63 |
| | Av. inbreeding | | | | | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | | | Full-fed |
| Pounds/day over feeding period | | | |

Ration:

All cattle fed the same ration.
30% ground grain sorghum
10% cottonseed meal
10% ground oats
50% ground sudan hay
Fortified with 1000 USP units Vit. A concentrate/lb. mixed feed

[a]Condition code (av. of three judges):
10-30 = thin
40-60 = medium
70-90 = fat

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Texas State

| | | | | | | |
|---|---|---|---|---|---|---|
| Location | McGregor | | | | | |
| Breed of sire | B. Swiss | | | | | |
| Breed of dam | 1x | | | | | |
| Line or group[1] | Crossbred | | | | | |
| Bulls: No. in group | | | | | | |
| Av. init. age | | | | | | |
| Av. init. wt. | | | | | | |
| Av.no.da.fed | | | | | | |
| Av. final wt. | | | | | | |
| ADG on test | | | | | | |
| Av. type sc. | | | | | | |
| Av. cond. sc. | | | | | | |
| Av. inbreeding | | | | | | |
| Heifers: No. in group | | | | | | |
| Av. init. age | | | | | | |
| Av. init. wt. | | | | | | |
| Av.no.da.fed | | | | | | |
| Av.final wt. | | | | | | |
| ADG on test | | | | | | |
| Av. type sc. | | | | | | |
| Av. cond. sc. | | | | | | |
| Av. inbreeding | | | | | | |
| Steers: No. in group | 5 | | | | | |
| Av. init. age | 320 | | | | | |
| Av. init. wt. | 716 | | | | | |
| Av.no.da.fed | 140 | | | | | |
| Av. final wt. | 1003 | | | | | |
| ADG on test | 2.1 | | | | | |
| Av. type sc. | | | | | | |
| Av. cond. sc. | 55 | | | | | |
| Av. inbreeding | | | | | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | | | Full-fed |
| Pounds/day over feeding period | | | |
| Ration: | All cattle fed the same ration.<br>30% ground grain sorghum<br>10% cottonseed meal<br>10% ground oats<br>50% ground sudan hay<br>Fortified with 1000 USP units Vit. A concentrate/lb. mixed feed | | |

[a]Condition code (av. of three judges):
10-30 = thin
40-60 = medium
70-90 = fat

FORM III
SLAUGHTER DATA, 1963

Texas State

| Location | McGregor | McGregor | McGregor | McGregor | McGregor | McGregor |
|---|---|---|---|---|---|---|
| Breed of sire | S. Gert. | S. Gert. | Charbray | B. Swiss | Charolais | Charbray |
| Breed of dam | 11x | 32x | 1x | 1x | 36x | 13x |
| Line or group | Crossbred | Crossbred | Crossbred | Crossbred | Crossbred | Crossbred |
| Sex | Steers | Steers | Steers | Steers | Steers | Steers |
| Age at slaughter | 360 | 358 | 384 | 395 | 395 | 390 |
| No. slaughtered | 2 | 2 | 2 | 2 | 1 | 1 |
| Days in feedlot | 141 | 141 | 141 | 141 | 141 | 141 |
| Final feedlot weight | 888 | 754 | 1055 | 899 | 1045 | 1192 |
| Slaughter wt., live | | | | | | |
| Carcass wt., cold | 513 | 427 | 629 | 528 | 673 | 717 |
| Dressing percent, cold | | | | | | |
| Carcass grade, quality | G+ | G | G+ | G | St | G |
| Carcass grade, cutability | | | | | | |
| Est. percent, kidney fat | | | | | | |
| Rib-eye area/100 lbs.carc.(sq.in.) | 1.71 | 1.85 | 1.62 | 1.76 | 2.15 | 1.47 |
| Marbling score, USDA | | | | | | |
| Fat thickness over ribeye(in.)[1] | 0.80 | 0.34 | 0.66 | 0.64 | 0.39 | 0.76 |
| W-B shear force, lbs.[2] | 7.72 | 13.90 | 7.12 | 12.49 | 10.28 | 9.76 |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

1/2" core, 1" long

FORM III
SLAUGHTER DATA, 1963

Texas State

| Location | McGregor | McGregor | | | | |
|---|---|---|---|---|---|---|
| Breed of sire | Charbray | Charolais | | | | |
| Breed of dam | 3x | 66x | | | | |
| Line or group | Crossbred | Crossbred | | | | |
| Sex | Steers | Steers | | | | |
| Age at slaughter | 404 | 402 | | | | |
| No. slaughtered | 1 | 1 | | | | |
| Days in feedlot | 141 | 141 | | | | |
| Final feedlot weight | 1140 | 938 | | | | |
| Slaughter wt., live | | | | | | |
| Carcass weight, cold | 611 | 558 | | | | |
| Dressing percent, cold | | | | | | |
| Carcass grade, quality | G | G+ | | | | |
| Carcass grade, cutability | | | | | | |
| Est. percent, kidney fat | | | | | | |
| Rib-eye area/100 lbs. carc. (sq. in.) | 1.87 | 2.40 | | | | |
| Marbling score, USDA | | | | | | |
| Fat thickness over ribeye (in.)[1] | 0.42 | 0.40 | | | | |
| W-B shear force, lbs.[2] | 13.02 | 12.32 | | | | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

VIRGINIA POLYTECHNIC INSTITUTE
Agricultural Experiment Station

I. PROJECT: S-031-8 (S-10)

Evaluation of the Effectiveness of Selection for Economic Traits in Beef Cattle

II. OBJECTIVES:

To obtain estimates of genetic parameters from field data to include:

a. heritability and repeatability of traits,
b. phenotypic and genetic correlations, and
c. construction of selection indexes.

To study the effects of location on performance records and on adjustment factors needed.

To determine the minimum gains required to obtain measurable genetic difference among animals.

To study the factors influencing performance and sale price of ROP bulls.

To evaluate the effectiveness of selection on the improvement of beef cattle under farm conditions.

III. PERSONNEL:

T. J. Marlowe, J. L. Gill, and T. N. Meacham

IV. ACCOMPLISHMENTS DURING THE YEAR:

The project was revised and enlarged during the year. A re-evaluation of the constants now used in the Virginia BCIA program to correct for non-genetic differences and a study of the relationship of mature weight of parents to performance of offspring have been completed and the results have either been published or are now in manuscript for publication. Evaluation of the effectiveness of selection has been considerably broadened under the revised project to more effectively evaluate the genetic improvement that is being made in herds participating in performance testing programs.

1. Non-genetic influences on calf performance.

Data collected in 111 Angus and 82 Hereford herds in the Virginia BCIA program during 1957 through 1962 were used to obtain new estimates of the effects of age, sex, month of birth, year, management practice, and

age of dam on calf performance. There were 17,294 Angus records and 11,663 Hereford records. Individual estimates were obtained by breed and management practice. The unadjusted means are shown in table 1 and the partial regression coefficients in table 2. These values agree fairly well with those reported by Marlowe and Gaines (1958) based on a much smaller number of records during 1953 through 1956 from some of the same herds. All factors studied had a significant influence on preweaning gains and grade. The effects are of sufficient magnitude to justify the use of correction factors in most instances.

2. Two methods of estimating age of cow effect.

Another study was made to compare two methods of estimating age of cow effect on calf performance. Method 1 compared averages of all records at each age. Method 2 compared records of mature cows with their own records at younger ages. Data included 15,436 Angus records (8,985 in Method 2) from 59 herds and 9,012 Hereford records (5,216 in Method 2) from 37 herds during 1954 through 1962, with records available on the entire calf crop for at least four years. Only cows with three or more calf records were used in Method 2. All estimates were within herds. Age, sex, month of birth, management practice, and year were held constant by least squares procedures. Cow's age had a significant effect ($P < .01$) on calf gain and grade in both methods. Gains increased with cow's age from 2 to 6 years, remained approximately the same from 6 to 11 years, and decreased slightly thereafter. Grades were generally lower for two and three-year-olds and decreased slightly after seven years. Method 2 gave slightly smaller estimates of differences between mature (6-11 years) and young (2-3 years) cows:

| | Angus | Hereford |
|---|---|---|
| ADG, 2-year-olds | -.18 ± .01 vs. -.16 ± .01 | -.23 ± .01 vs. -.19 ± .01 |
| ADG, 3-year-olds | -.10 ± .01 vs. -.08 ± .01 | -.11 ± .01 vs. -.08 ± .01 |

Estimates of other age differences were approximately the same for both methods. These findings indicate that either little selection was made for milking ability or that selection was not very effective in these herds during the period studied.

3. Heritability estimates of preweaning gain, grade, and index.

Records on 12,145 Angus calves by 596 different sires in 106 herds and 8,279 Hereford calves by 420 different sires in 84 herds were used to estimate heritabilities and phenotypic and genetic correlations among preweaning growth rate, grade, and index from sire component analyses. Data were separated into subsets by year, season of birth, and management practice for each breed, as shown in table 3. Each subset was analyzed separately and all subset results were pooled to obtain the estimates. Herd differences were taken into account by inclusion in the model.

Heritability was estimated as the ratio of 4 times the sire component of variance to the sum of the sire and within sire variances. Standard

TABLE 1. Unadjusted Means of Preweaning Gains and Type Scores by Breed and Management Practice

| Effects studied | Number of calves | | | | Average daily gain | | | | Type score | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Angus | | Hereford | | Angus | | Hereford | | Angus | | Hereford | |
| | No creep | Creep | No creep | Creep | No creep | Creep | No creep | Creep | No creep | Creep | No creep | Creep |
| Age of calf (days): | | | | | | | | | | | | |
| 90-119 | 616 | 74 | 371 | 105 | 1.78 | 1.83 | 1.72 | 1.71 | 11.5 | 11.9 | 11.2 | 11.5 |
| 120-149 | 1725 | 334 | 981 | 265 | 1.68 | 1.75 | 1.69 | 1.74 | 11.5 | 12.0 | 11.2 | 11.7 |
| 150-179 | 2783 | 529 | 1527 | 441 | 1.69 | 1.72 | 1.67 | 1.78 | 11.6 | 12.1 | 11.3 | 12.0 |
| 180-209 | 3214 | 715 | 1900 | 769 | 1.63 | 1.71 | 1.64 | 1.74 | 11.6 | 12.3 | 11.4 | 12.3 |
| 210-239 | 3216 | 758 | 2161 | 669 | 1.61 | 1.71 | 1.58 | 1.80 | 11.7 | 12.4 | 11.5 | 12.4 |
| 240-269 | 1837 | 492 | 1258 | 310 | 1.57 | 1.70 | 1.55 | 1.75 | 11.8 | 12.5 | 11.5 | 12.2 |
| 270-299 | 766 | 235 | 662 | 243 | 1.46 | 1.63 | 1.49 | 1.65 | 11.6 | 12.4 | 11.3 | 11.8 |
| Sex of calf: | | | | | | | | | | | | |
| Bulls | 1788 | 978 | 1069 | 1017 | 1.80 | 1.88 | 1.78 | 1.96 | 11.8 | 12.5 | 11.7 | 12.3 |
| Heifers | 7025 | 1484 | 4408 | 1381 | 1.56 | 1.61 | 1.55 | 1.63 | 11.9 | 12.5 | 11.6 | 12.2 |
| Steers | 5344 | 675 | 3383 | 404 | 1.67 | 1.70 | 1.65 | 1.65 | 11.2 | 11.4 | 11.0 | 11.4 |
| Month of birth: | | | | | | | | | | | | |
| January | 2736 | 456 | 2148 | 564 | 1.63 | 1.73 | 1.58 | 1.74 | 11.8 | 12.5 | 11.4 | 12.3 |
| February | 2617 | 317 | 1589 | 309 | 1.67 | 1.74 | 1.63 | 1.77 | 11.6 | 12.4 | 11.3 | 12.0 |
| March | 2713 | 524 | 1678 | 272 | 1.70 | 1.79 | 1.69 | 1.84 | 11.6 | 12.3 | 11.4 | 12.1 |
| April | 1584 | 262 | 978 | 201 | 1.70 | 1.80 | 1.70 | 1.77 | 11.6 | 12.2 | 11.3 | 12.1 |
| May | 697 | 254 | 407 | 342 | 1.69 | 1.76 | 1.68 | 1.86 | 11.7 | 12.5 | 11.5 | 12.8 |
| June | 169 | 111 | 102 | 129 | 1.60 | 1.63 | 1.60 | 1.70 | 11.6 | 12.4 | 11.4 | 12.2 |
| July | 275 | 225 | 32 | 87 | 1.54 | 1.69 | 1.45 | 1.64 | 11.8 | 12.2 | 11.3 | 11.9 |
| August | 138 | 153 | 22 | 96 | 1.39 | 1.65 | 1.33 | 1.63 | 11.6 | 12.2 | 11.0 | 12.4 |
| September | 275 | 189 | 64 | 264 | 1.36 | 1.63 | 1.42 | 1.73 | 11.0 | 12.2 | 11.6 | 12.3 |
| October | 332 | 153 | 79 | 138 | 1.44 | 1.60 | 1.53 | 1.75 | 11.1 | 12.0 | 11.3 | 12.1 |
| November | 802 | 228 | 378 | 227 | 1.50 | 1.60 | 1.49 | 1.66 | 11.7 | 12.0 | 11.6 | 11.5 |
| December | 1819 | 265 | 1383 | 173 | 1.58 | 1.67 | 1.52 | 1.72 | 11.7 | 12.3 | 11.3 | 11.6 |
| Age of dam (years): | | | | | | | | | | | | |
| 2.0-2.9 | 1637 | 431 | 857 | 377 | 1.51 | 1.55 | 1.41 | 1.61 | 11.5 | 12.2 | 10.9 | 11.9 |
| 3.0-3.9 | 1864 | 418 | 1265 | 388 | 1.60 | 1.65 | 1.55 | 1.72 | 11.7 | 12.2 | 11.3 | 12.2 |
| 4.0-4.9 | 1917 | 374 | 1283 | 430 | 1.63 | 1.70 | 1.60 | 1.72 | 11.8 | 12.4 | 11.4 | 12.0 |
| 5.0-5.9 | 1661 | 331 | 1138 | 449 | 1.65 | 1.71 | 1.65 | 1.77 | 11.8 | 12.5 | 11.5 | 12.4 |
| 6.0-11.9 | 6214 | 1373 | 4004 | 1056 | 1.67 | 1.78 | 1.67 | 1.82 | 11.6 | 12.3 | 11.5 | 12.2 |
| 12/older | 864 | 210 | 313 | 102 | 1.63 | 1.76 | 1.65 | 1.78 | 11.2 | 11.7 | 11.4 | 11.8 |
| Pre- or postweaning: | | | | | | | | | | | | |
| Preweaning | 13882 | 2756 | 8715 | 2471 | 1.64 | 1.72 | 1.61 | 1.74 | 11.6 | 12.3 | 11.4 | 12.1 |
| Weaned | 275 | 381 | 145 | 331 | 1.49 | 1.65 | 1.59 | 1.82 | 11.1 | 12.1 | 11.4 | 12.3 |
| Gen. Mean | 14157 | 3137 | 8860 | 2802 | 1.63 | 1.71 | 1.61 | 1.75 | 11.6 | 12.3 | 11.4 | 12.1 |

TABLE 2. Least Squares Estimates of the Effects of Age, Sex, and Month of Birth of Calf, Age of Dam, and Management on Gains and Type Scores of Beef Calves

| Effects studied | Average Daily Gains | | | | Type Score | | | |
|---|---|---|---|---|---|---|---|---|
| | Angus | | Hereford | | Angus | | Hereford | |
| | No Creep | Creep | No Creep | Creep | No Creep | Creep | No Creep | Creep |
| Age of calf (Days): | | | | | | | | |
| 90-119 | 0.16±.011 | 0.05±.023 | 0.07±.015 | 0.01±.032 | -.43±.06 | -.58±.13 | -.48±.08 | -.85±.14 |
| 120-149 | 0.06±.007 | -.01±.013 | 0.04±.010 | -.04±.019 | -.35±.04 | -.47±.07 | -.39±.05 | -.77±.08 |
| 150-179 | 0.04±.006 | -.02±.011 | 0.03±.008 | -.03±.016 | -.20±.03 | -.29±.06 | -.24±.04 | -.54±.07 |
| 180-209 | 0.01±.006 | 0.00±.010 | 0.01±.007 | -.05±.014 | -.15±.03 | -.11±.05 | 0.10±.04 | -.16±.06 |
| 210-239[a] | 0.00±.006 | 0.00±.010 | 0.00±.023 | 0.00±.013 | 0.00±.03 | 0.00±.05 | 0.00±.02 | 0.00±.06 |
| 240-269 | -.01±.007 | -.02±.011 | -.02±.009 | -.04±.019 | 0.06±.04 | 0.24±.06 | 0.02±.05 | 0.14±.08 |
| 270-299 | -.04±.033 | -.06±.011 | -.05±.013 | 0.10±.025 | 0.04±.06 | 0.23±.08 | -.04±.07 | 0.49±.11 |
| Sex of calf: | | | | | | | | |
| Bulls | 0.11±.004 | 0.14±.006 | 0.11±.006 | 0.19±.009 | 0.59±.02 | 0.84±.03 | 0.43±.03 | 0.38±.04 |
| Heifers | -.11±.009 | -.12±.005 | -.10±.004 | -.09±.008 | 0.76±.02 | 1.00±.03 | 0.58±.02 | 0.49±.04 |
| Steers[a] | 0.00±.010 | 0.00±.007 | 0.00±.006 | 0.00±.011 | 0.00±.02 | 0.00±.04 | 0.00±.23 | 0.00±.05 |
| Month of birth: | | | | | | | | |
| January | -.03±.007 | -.03±.012 | -.05±.011 | -.02±.017 | 0.02±.04 | -.09±.06 | 0.00±.06 | 0.26±.07 |
| February[a] | 0.00±.007 | 0.00±.013 | 0.00±.032 | 0.00±.018 | 0.00±.14 | 0.00±.07 | 0.00±.17 | 0.00±.08 |
| March | 0.07±.007 | 0.04±.011 | 0.02±.011 | 0.09±.020 | 0.08±.04 | -.19±.06 | 0.09±.06 | 0.41±.09 |
| April | 0.02±.009 | 0.05±.015 | 0.04±.013 | 0.05±.023 | 0.09±.05 | -.14±.08 | 0.08±.07 | 0.46±.10 |
| May | 0.00±.011 | 0.04±.015 | 0.02±.016 | 0.05±.018 | 0.22±.06 | 0.06±.08 | 0.02±.09 | 0.58±.08 |
| June | -.03±.015 | -.05±.025 | -.01±.025 | -.06±.028 | -.09±.10 | 0.13±.11 | -.03±.13 | 0.56±.12 |
| July | -.16±.018 | -.04±.017 | -.14±.042 | -.08±.037 | 0.03±.10 | -.01±.09 | -.10±.22 | 0.62±.16 |
| August | -.23±.020 | -.06±.019 | -.23±.051 | -.17±.031 | -.19±.11 | -.12±.10 | -.29±.27 | 0.33±.13 |
| September | -.26±.014 | -.12±.018 | -.17±.032 | -.08±.021 | -.58±.08 | -.31±.09 | -.13±.17 | -.15±.09 |
| October | -.18±.013 | -.10±.019 | -.10±.030 | -.08±.026 | -.46±.08 | -.26±.10 | -.06±.16 | -.07±.11 |
| November | -.12±.011 | -.08±.015 | -.08±.017 | -.06±.025 | -.03±.06 | -.25±.08 | 0.16±.09 | 0.08±.11 |
| December | -.06±.009 | -.06±.015 | -.07±.013 | -.02±.026 | 0.02±.05 | -.14±.08 | 0.01±.07 | 0.05±.11 |
| Age of dam (years): | | | | | | | | |
| 2.0-2.9 | -.21±.006 | -.20±.010 | -.28±.008 | -.20±.015 | -.10±.03 | -.04±.05 | -.47±.04 | -.26±.07 |
| 3.0-3.9 | -.11±.005 | -.10±.024 | -.15±.007 | -.08±.015 | 0.08±.03 | 0.03±.05 | -.13±.04 | -.05±.06 |
| 4.0-4.9 | -.07±.005 | -.04±.011 | -.10±.007 | -.06±.014 | 0.11±.03 | 0.20±.06 | -.02±.04 | -.08±.06 |
| 5.0-5.9 | -.02±.005 | -.04±.012 | -.03±.007 | -.01±.014 | 0.16±.03 | 0.18±.06 | 0.02±.04 | 0.16±.06 |
| 60-11.9[a] | 0.00±.004 | 0.00±.007 | 0.00±.006 | 0.00±.010 | 0.00±.02 | 0.00±.04 | 0.00±.03 | 0.00±.05 |
| 12/older | -.05±.007 | 0.03±.013 | -.04±.013 | -.08±.027 | -.47±.04 | -.37±.07 | -.31±.07 | -.42±.12 |
| Management: | | | | | | | | |
| Preweaning | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Weaned | -.04±.008 | -.05±.008 | -.09±.015 | -.02±.011 | -.66±.04 | -.13±.04 | -.42±.08 | -.17±.05 |

[a]Selected base.

TABLE 3. Grouping of Data for Analysis of Variance and Covariance

| Group | Management practice | Season of birth | Number of observations: Bulls | Steers | Heifers | Combined[a] | Sire-year groups | No. diff. sires[b] |
|---|---|---|---|---|---|---|---|---|
| Angus | | | | | | | | |
| 1 | No creep | Jan.-May | 1,057 | 3,273 | 4,238 | 8,712 | 765 | 436 |
| 2 | No creep | June-Dec. | 173 | 426 | 625 | 1,308 | 190 | 154 |
| 3 | Creep | Jan.-May | 336 | 452 | 797 | 1,652 | 189 | 144 |
| 4 | Creep | June-Dec. | 247 | 106 | 415 | 808 | 136 | 104 |
| Total Angus: | | | 1,813 | 4,257 | 6,075 | 12,480 | 1,280 | 596 |
| Hereford | | | | | | | | |
| 5 | No creep | Jan.-May | 563 | 2,309 | 2,872 | 5,854 | 510 | 303 |
| 6 | No creep | June-Dec. | 59 | 147 | 220 | 458 | 89 | 66 |
| 7 | Creep | Jan.-May | 505 | 293 | 780 | 1,658 | 210 | 157 |
| 8 | Creep | June-Dec. | 197 | 53 | 281 | 581 | 102 | 75 |
| Total Hereford: | | | 1,324 | 2,802 | 4,153 | 8,551 | 911 | 420 |

[a]Number of observations by sex do not add up to combined totals because of limitations placed on number of calves per sire.

[b]Combined totals less than sum of subset totals because many sires had progeny in both seasons and some had progeny in both management practices.

errors of heritability estimates were computed according to the method developed by Hazel and Terrill (1945). Genetic correlations were computed as the ratio of the sire component of covariance to the square root of the product of the appropriate sire components of variance. The reliability of the genetic correlation estimate was calculated according to the method outlined by Falconer (1960). Phenotypic correlations were approximated as the square root of $1/N - 3$, where N is the number of paired observations. Heritability estimates by sex classes and combined are shown in table 4.

4. Genetic and phenotypic correlations.

Correlations between ADG and grade were not computed for the individual sexes, since the heritability estimates were not significantly different among the sexes. Combined estimates for Angus were $0.28 \pm .01$ and $0.28 \pm .06$; and $0.30 \pm .01$ and $0.23 \pm .07$ for Herefords for phenotypic and genetic correlations, respectively.

TABLE 4. Estimates of Heritability for ADG, Grade, and Index

| Breed | Sex | Number of observations | Heritability Estimate ADG | Grade | Index |
|---|---|---|---|---|---|
| Angus | Bulls | 1,813 | 0.49±.10 | 0.27±.06 | 0.30±.10 |
| | Steers | 4,257 | 0.43±.06 | 0.37±.03 | 0.46±.06 |
| | Heifers | 6,075 | 0.31±.06 | 0.39±.03 | 0.34±.05 |
| | Combined | 12,480[a] | 0.36±.03 | 0.34±.03 | 0.36±.03 |
| Hereford | Bulls | 1,324 | 0.33±.12 | 0.69±.08 | 0.34±.11 |
| | Steers | 2,802 | 0.27±.07 | 0.19±.03 | 0.14±.06 |
| | Heifers | 4,153 | 0.31±.06 | 0.33±.03 | 0.32±.05 |
| | Combined | 8,551[a] | 0.26±.03 | 0.29±.03 | 0.30±.03 |

[a]Number of observations by sex do not add up to combined totals because of limitations placed on number of calves per sire.

V. FUTURE PLANS:

As mentioned previously, this project has been revised and considerably broadened in some respects to more effectively evaluate the genetic improvement that is being made in herds participating in performance testing programs. To accomplish this, the following procedures will be used:

Procedure I. An estimate of the genetic change will be obtained by comparing the change in performance of half-sibs (from dams of the same age) by the same sire over two or more years with the over-all mean change in performance in the same herds during the same years. Doubling of this difference provides an estimate of the genetic change which has occurred. This will be done for a large number of sires in many herds and a pooled average estimate obtained. The environmental change will be estimated by comparing the performance of full-sibs in successive years, after correcting for age of dam. By subtracting first the genetic change and then the environmental change from the total change, alternate estimates of the two components may be obtained and compared.

Procedure II. This approach to estimating the genetic progress in BCIA herds will be by comparing the performance of contemporary progenies produced in the same herd and year from two groups of Culpeper ROP bulls with birth dates differing by 4 or 5 years. More specifically, semen will be collected from approximately 10 or 12 bulls of average performance from the 1959-1960 test and from a like number

in the 1964-1965 test, and will be used on groups of approximately 100 commercial cows per year for three years in the herd of Henry Heth, Blacksburg. Extra semen from all bulls will be stored for comparison with another group of 10 or 12 bulls from the 1969-1970 test. These contemporary comparisons of progeny from sires selected from different birth years give unbiased estimates of half of the absolute genetic progress.

Procedure III. The estimates obtained in Procedure I above from one or more large herds will be compared with the expected response to selection based on $h^2$ x selection differential x time.

## VI. PUBLICATIONS DURING THE YEAR:

Marlowe, T. J. 1963. Considerations in the performance testing of beef cattle. Virginia Angus Handbook, 1963-1964.

## VII. PUBLICATIONS PLANNED:

Marlowe, T. J., C. C. Mast, and R. R. Schalles. 1964. Beef cattle parameters from field data. I. Non-genetic influences on calf performance. (Submitted to Journal of Animal Science).

Marlowe, T. J., C. C. Mast, and D. M. Sheehan. 1964. Beef cattle parameters from field data. II. Two methods of estimating age of cow effect on calf performance. (In manuscript)

Marlowe, T. J., and D. W. Vogt. 1964. Beef cattle parameters from field data. III. Heritability of preweaning gain, grade, and index estimated from sire component analyses. (In manuscript)

Vogt, D. W., and T. J. Marlowe. 1964. Beef cattle parameters from field data. IV. Genetic and phenotypic correlations estimated from dam-daughter regression analyses. (In manuscript)

Publications related to discontinued dwarfism project:

Marlowe, T. J. 1963. Variations among homozygous dwarf, heterozygotes, and homozygous normal beef cattle. Va. J. Sci., Proc. 14:170.

Marlowe, T. J. 1964. Evidence of selection for the Snorter dwarf gene in cattle. J. Animal Sci. 23:454.

Submitted by: T. J. Marlowe

I. PROJECT: Hatch 93901, AHRD Line Project d1-7 (S-10)

Heterosis from Crosses Among British Breeds of Beef Cattle

II. OBJECTIVES:

To measure heterosis obtained from crosses among the Angus, Hereford, and Shorthorn breeds, as shown by growth rate, fattening ability, and carcass quality up to approximately two years of age.

To measure the productive ability of crossbred versus purebred dams.

III. PERSONNEL:

D. W. Vogt, W. H. McClure, R. C. Carter, J. A. Gaines, and J. S. Copenhaver

IV. ACCOMPLISHMENTS DURING THE YEAR:

The experimental work under Objective 1 was completed with the slaughter of the steers from the fifth, and final, calf crop in February 1963. Data from this phase have been analyzed and manuscripts are being prepared for publication.

In the second phase, comparisons are made among crossbred and purebred dams for heterosis in maternal traits. Purebred dams are bred to crossbred bulls and crossbred dams to purebred bulls. All calves are, thus, either three-breed or backcrosses in all possible combinations of the three breeds involved - Angus, Hereford, and Shorthorn. This permits an estimate of heterosis in the dams without confounding with heterosis in the calves.

The first calf crop in this phase was born in the late winter and early spring of 1963. All cows were three-year-olds raising their first calves. Calves were weaned in early October. After a 28-day adjustment period, they were put on full-feed in groups in dry lot on fattening rations. The heifers were fed for 168 days, and the steers were fed for 196 days. Results to weaning are summarized by purebred and crossbred dams in table 1.

Calving percentages, born and weaned, were quite satisfactory for first-calf heifers. Of the 60 cows in each group, 55 purebred and 58 crossbred cows calved, with calving percentages of 91.7 percent and 96.7 percent, respectively. Each group weaned the same number of calves - 53 - for a weaning percentage of 88.3. Calves from crossbred dams averaged 3 lbs. heavier at birth and gained 0.09 lb. more per day from birth to weaning. The summer of 1963 was very dry and weaning weights were fairly low, averaging only a little over 400 lbs. Steer calves from crossbred dams averaged 28 lbs. heavier and heifer calves averaged 10 lbs. heavier than calves from purebred dams, the average advantage being 19.6 lbs.

TABLE 1. Cow Productivity and Calf Performance to Weaning, 1963 Calf Crop

| | Purebred Dams | Crossbred Dams |
|---|---|---|
| No. cows bred | 60 | 60 |
| No. cows calving | 55 | 58 |
| Calves born | 55 | 58 |
| Calves weaned | 53 | 53 |
| Percentage born | 91.7 | 96.7 |
| Calf crop weaned | 88.3 | 88.3 |
| Av. birth weight | 64.4 | 67.4 |
| Daily gain to weaning | 1.40 | 1.49 |
| Av. weaning weight, steers | 400 | 428 |
| Av. weaning weight, heifers | 400 | 410 |
| Av. weaning grade | 12.2 | 11.9 |

V. FUTURE PLANS:

Phase II of this project will be continued as outlined.

VI. PUBLICATIONS DURING THE YEAR:

Carter, R. C., W. H. McClure, J. A. Gaines, and D. W. Vogt. 1963. Heterosis from crosses among British breeds of beef cattle. "Genetics Today," Proc. XI Int. Congress Genetics I:265.

Vogt, D. W., J. A. Gaines, W. H. McClure, and R. C. Carter. 1964. Post-weaning performance of crossbred vs. straightbred calves. J. Animal Sci. 23:306 (abs.).

VII. PUBLICATIONS PLANNED:

Manuscripts for submission to the Journal of Animal Science giving complete results of the first phase are in preparation.

Submitted by: R. C. Carter

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Virginia State

| Location | Steeles Tavern | Steeles Tavern | Steeles Tavern | Steeles Tavern | Steeles Tavern | Steeles Tavern |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Hereford | Shorthorn | A x H | A x S | H x S |
| Breed of dam | 5 A x H<br>5 A x S<br>10 H x S | 5 A x H<br>5 H x S<br>10 A x S | 5 A x S<br>5 H x S<br>10 A x H | 5 Angus<br>5 Hereford<br>10 S'horn | 5 Angus<br>5 S'horn<br>10 H'ford | 5 Hereford<br>5 S'horn<br>10 Angus |
| Line or group[1] | Crossbred[a] | Crossbred | Crossbred | Purebred | Purebred | Purebred |
| No. cows exposed[2] | 20 | 20 | 20 | 20 | 20 | 20 |
| No. calves born[3] | 19 | 19 | 20 | 18 | 17 | 20 |
| Calving per-cent, born | 95 | 95 | 100 | 90 | 85 | 100 |
| Av. birth date | 2-09-63 | 2-14-63 | 2-09-63 | 2-07-63 | 2-17-63 | 2-18-63 |
| Av. birth wt. | 63 | 70 | 69 | 66 | 72 | 62 |
| No. calves weaned | 17 | 18 | 18 | 17 | 17 | 19 |
| Calving per-cent, weaned[4] | 85 | 90 | 90 | 85 | 85 | 95 |
| Av. weaning age, days | 240 | 235 | 240 | 242 | 232 | 231 |
| Adj. ADG[5] | 1.45 | 1.59 | 1.42 | 1.40 | 1.42 | 1.46 |
| Av. type sc.[6] | 12.3 | 12.1 | 11.4 | 12.5 | 11.9 | 12.1 |
| Av. cond. sc.[6] | | | | | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

No adjustments

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

[a]Includes reciprocal crosses.

BEEF CATTLE RESEARCH STATION
Front Royal, Virginia

I. PROJECT: AH 150.16, AHRD Line Project d1-4 (S-10)

The Improvement of Beef Cattle for Virginia Through Breeding Methods

II. OBJECTIVES:

Beef cattle research projects are conducted with three breeds of cattle (Angus, Hereford, and Shorthorn) and are associated with problems relating to the improvement of beef cattle for Virginia through breeding methods.

The objectives of the investigation are as follows:

To estimate the progress to be expected from mass selection, as compared with family selection, in the improvement of beef cattle.

To evaluate selection criteria and procedures and develop more precise and effective measures of quality and performance in beef cattle.

To simplify methods of progeny or sib testing whereby breeding cattle can be evaluated at comparatively young ages.

The long-term breeding program for the work at Front Royal may be roughly subdivided into five phases, each of which has some direct bearing on the main objectives, as stated above.

(1) Test from weaning to yearling age those bull calves which appear to be herd-sire prospects on the basis of their pre-weaning performance.

(2) Progeny test as yearlings those bulls with favorable records from Phase 1.

(3) Choose as foundation sires those bulls with good records from Phases 1 and 2. Obtain 32 daughters by each foundation sire and out of unrelated cows.

(4) Allot 32 daughters from each foundation sire as follows: 16 are placed back with their sire to form an inbred line; 8 become a part of a growth herd where selection emphasis is on growth; and 8 become part of a type herd were selection emphasis is on type. For each breeding plan, measure the progress in terms of changes in growth rate and conformation. Compare the actual results with those expected from theoretical consideration.

(5) Test inbred lines for combining ability and outcross performance.

III. PERSONNEL:

B. M. Priode, K. P. Bovard, R. C. Carter, E. J. Warwick, and R. S. Temple

IV. ACCOMPLISHMENTS DURING THE YEAR:

1. Scope and nature of work.

The scope and nature of the project have remained essentially unchanged since its inception. Calves from inbred lines are now relatively more highly inbred than in earlier years. Also, mild inbreeding of less than 10 percent has occurred in the Angus and Shorthorn selection herds.

Bulls from four Front Royal lines - A-4 (Blackwood Bandy), A-7 (type selection), S-2 (Baron Rothes), and S-8 (growth selection) - are being tested on 60 grade cows at Blacksburg. Routine type and growth performance data to weaning will be obtained.

2. Research results.

a. Inbred Snorter born. A Snorter dwarf Angus heifer, No. 3243 A-1, 36 percent inbred, was born in March 1963. There was no previous history of Snorter dwarfism in the A-1 line at Front Royal, but the dwarf's grandsire, 1166 A-1, was reported to have produced dwarfs in artificial use by the Virginia Artificial Breeders' Association, Rocky Mount, Virginia. An effort will be made to detect the possible path by which the gene entered this line.

b. Branding study completed. Hot iron vs. chemical brands on rib vs. hip areas were compared on 39 steers branded in December 1962 and scored for legibility in May 1963. Results shown in table 1 indicate that electric hot iron brands were more legible than acid brands and that the hip was evidently a better site for a three-digit brand than was the upper rib area. Histological studies of the hide and of the subcutaneous tissue underlying the brand areas are planned following slaughter.

TABLE 1. Brand Scores[1] by Method and Site

| Site | Method | | Average |
|---|---|---|---|
| | Chemical | Hot iron | |
| Hip | 2.24 | 2.91 | 2.57 |
| Rib | 2.13 | 2.86 | 2.51 |
| Average | 2.19 | 2.89 | 2.54 |

[1]Score indicates number of legible digits, with 3.0 a perfect score.

TABLE 2. Analysis of Variance of Brand Scores

| Source | df | Mean Squares |
|---|---|---|
| Methods | 1 | 9.6955** |
| Sites | 1 | 0.0801 |
| Method x Site | 1 | 0.0626 |
| Error | 74 | 0.4567 |
| Total | 77 | |

** P < .01

c. Vitamin A Supplementation Favorable. Calf losses among cows receiving Vitamin A supplement through the winter of 1962-1963 were smaller than among calves of non-supplemented cows. Results among inbreds were more striking than, but not statistically different from, those among non-inbreds, as shown in table 3.

TABLE 3. Calf Survival, as Affected by Vitamin A Supplementation and Inbreeding, 1963

| | Inbred | | Non-Inbred | | |
|---|---|---|---|---|---|
| | No Vitamin A | Vitamin A | No Vitamin A | Vitamin A | Total |
| Lived | 94 | 32 | 124 | 57 | 307 |
| Died | 12 | 8 | 9 | 7 | 36 |
| Total | 106 | 40 | 133 | 64 | 343 |
| | $\chi^2$ = 1.85, P < .20 | | $\chi^2$ = 1.00, P < .50 | | |
| | Interaction $\chi^2$ = 0.20, P < .70 | | | | |

Also, at the conclusion of the 1963 breeding season, cows which received Vitamin A the previous winter showed a 9.1 percent advantage over "No Vitamin A" cows (P < .05), as shown in table 4.

TABLE 4. Vitamin A Feeding and Subsequent Breeding Season Results for Cows in Vitamin A Experiment, 1962-1963

| | Vitamin A | | No Vitamin A | | Total |
|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Number |
| Pregnant | 229 | 90.2 | 73 | 81.1 | 302 |
| Open | 25 | 9.8 | 17 | 18.9 | 42 |
| Total | 254 | | 90 | | 344 |

$\chi^2$ = 4.26*, P < .05

d. Early topcross results favorable. Conformation scores and average daily gains to weaning on 53 calves sired by inbred and selection sires from the Front Royal lines and out of grade cows kept at Blacksburg were compared. Type scores and gains of topcross calves by A-4 and S-2 inbred sires were as good or better than those of selection herd sires from A-7 and S-8, as shown in table 5.

TABLE 5. Test Progeny Performance of Calves Raised at Blacksburg in 1963 Sired by A-4, A-7, S-2, and S-8 Bulls from the Front Royal Station

| Sire | | | Calf Performance | | | |
|---|---|---|---|---|---|---|
| Ear tag | Bd./Ln. | Fx | Number | Sex | Type | ADG |
| 1592 | A-4 | 0.25 | 11 | M | 13.3 | 1.97 |
| | | | 6 | F | 13.3 | 1.83 |
| | Average: | | 17 | | 13.3 | 1.90 |
| 1524 | A-7 | 0.10 | 9 | M | 12.9 | 1.83 |
| | | | 6 | F | 12.9 | 1.75 |
| | Average: | | 15 | | 12.9 | 1.79 |
| 0152 | S-2 | 0.30 | 5 | M | 12.5 | 2.01 |
| | | | 6 | F | 14.2 | 1.72 |
| | Average: | | 11 | | 13.4 | 1.86 |
| 1518 | S-8 | 0.16 | 5 | M | 13.1 | 2.00 |
| | | | 5 | F | 13.2 | 1.73 |
| | Average | | 10 | | 13.2 | 1.86 |

e. Calf performance to weaning. Least squares analyses of type and growth data of 2440 calves from birth to weaning were completed, making possible several comparisons among foundation, inbred, and selected lines, a sample of which is shown in table 6. Large differences were seen among lines in response to inbreeding. This is indicated by the difference between foundation and inbred lines for birth and midsummer weights, gain to weaning, and weaning type score. Weights and gains of the calves from the growth herd exceeded those of the "type" calves, and conversely, "type" calves' conformation scores were higher than those of "growth" calves. Further analysis of these data is planned, with study of variations among inbred lines, estimation of selection trends, and comparisons between inbreds and non-inbreds as objectives.

Response to inbreeding of calf and of dam was nearly opposite in Angus and Shorthorn calves. For example, in Angus each additional one percent inbreeding of the calf decreased average daily gain to weaning by -.0056 lb., whereas in Shorthorns the value was -.0031 lb. In contrast, similar regressions on percent inbreeding of the dam were -.0012 lb. in Angus and -.0047 lb. in Shorthorns. Further study of these results is needed.

TABLE 6. Angus Calf Performance from Birth to Weaning by Foundation and Inbred, Type, Growth, and Test Herds, 1950-1961, Inclusive

| Kind of herd | Number born, alive + dead | Birth to weaning data[a] | | | | | |
|---|---|---|---|---|---|---|---|
| | | Inbreeding | | Weight, lbs. | | Weaning Data | |
| | | Dam | Calf | Birth | Mid-summer | ADG | Type[b] |
| Foundation | | | | | | | |
| A-1 | 108 | .02 | .01 | 64.1 | 280 | 1.80 | 11.7 |
| A-2 | 58 | .01 | .01 | 57.7 | 263 | 1.71 | 11.7 |
| A-3 | 88 | .02 | 0 | 62.0 | 260 | 1.67 | 11.2 |
| A-4 | 81 | .01 | 0 | 64.0 | 271 | 1.70 | 11.1 |
| Av.- | 335 | .02 | .01 | 62.0 | 269 | 1.72 | 11.4 |
| Inbred | | | | | | | |
| A-1 | 69 | .07 | .23 | 60.2 | 272 | 1.74 | 11.3 |
| A-2 | 55 | .03 | .27 | 58.0 | 243 | 1.61 | 11.2 |
| A-3 | 18 | 0 | .25 | 55.2 | 239 | 1.54 | 10.7 |
| A-4 | 34 | .01 | .25 | 61.6 | 252 | 1.38 | 9.7 |
| Av.- | 176 | .03 | .25 | 58.8 | 252 | 1.57 | 10.7 |
| Selection | | | | | | | |
| Type | 106 | 0 | .04 | 58.6 | 257 | 1.69 | 11.9 |
| Growth | 107 | .01 | .02 | 64.2 | 276 | 1.76 | 11.5 |
| Test | 278 | .01 | 0 | 59.9 | 269 | 1.72 | 11.5 |
| Breed Av. | 1002 | .01 | .06 | 60.7 | 265 | 1.69 | 11.4 |

[a]Results from 785 calves with complete data through weaning.
[b]15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

Estimates of other "fixed effects", i.e., years, sex, age of dam, and age of calf, are in agreement with other published estimates of similar work.

V. FUTURE PLANS:

Topcross testing of sires from one selection and one inbred line, each, from Front Royal Angus and Shorthorn herds on cows at Blacksburg will be discontinued after 1963. In place of this, a larger herd of grade Shorthorn cows will be used in a systematic topcross testing plan to more reliably evaluate breeding values for topcrosses by bulls of the six Front Royal Shorthorn lines.

Cooperative progeny testing of Front Royal bulls in breeding herds of the Virginia correctional institutions will be continued and, where possible, increased.

In an effort to detect possible heterozygotes for Snorter dwarfism in the A-1 line, lumbar x-rays will be taken of A-1 calves at birth, and certain individuals will be progeny tested for additional information on the frequency of the gene in this line.

The Vitamin A nutritional studies will be modified and continued under the direction of T. N. Meacham at VPI.

VI. PUBLICATIONS DURING THE YEAR:

Bovard, K. P. and B. M. Priode. 1963. Research with beef cattle at the Front Royal station. Virginia Agr. Ext. Sta. Research Bulletin 547.

Meacham, T. N., K. P. Bovard, and B. M. Priode. 1964. Influence of Vitamin A supplementation of beef cows on calf vitality and survival. J. Animal Sci. 23:308 (abs.).

VII. PUBLICATIONS PLANNED:

Putman, P. A., K. P. Bovard, B. M. Priode, and R. Lehmann. 1964. Rumen volatile fatty acids and gains of record of performance bulls. J. Animal Sci. (In press).

Submitted by: B. M. Priode and
K. P. Bovard

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Virginia, Front Royal State

| Location | F. R. | F. R. | F. R. | F. R. | F. R. | F. R. |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Angus | Angus | Angus | Angus | Angus |
| Breed of dam | Angus | Angus | Angus | Angus | Angus | Angus |
| Line or group[1] | 8184-A1 | 1575-A1 | 0218-A2 | 1552-A3 | 0210-A4 | 0808-A7 |
| No. cows exposed[2] | 19 | 5 | 22 | 16 | 20 | 22 |
| No. calves born[3] | 10 | 5 | 21 | 12 | 12 | 16 |
| Calving percent, born | 52.6 | 100.0 | 95.4 | 75.0 | 60.0 | 72.7 |
| Av. birth date | 2-19-63 | 2-24-63 | 2-10-63 | 2-23-63 | 2-28-63 | 2-19-63 |
| Av. birth wt. | 57 | 62 | 54 | 64 | 67 | 56 |
| No. calves weaned | 5 | 3 | 16 | 9 | 9 | 14 |
| Calving percent, weaned[4] | 26.3 | 60.0 | 72.7 | 56.2 | 45.0 | 63.6 |
| Av. weaning age, days | 208 | 210 | 216 | 204 | 202 | 208 |
| Adj. ADG[5] | 1.78 | 1.92 | 1.74 | 1.82 | 1.62 | 1.76 |
| Av. type sc.[6] | 11.6 | 12.0 | 11.9 | 12.7 | 10.1 | 12.7 |
| Av. cond. sc.[6] | 9.1 | 9.7 | 9.0 | 9.6 | 8.4 | 9.9 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

Age of dam, season of birth, sex of calf, and creep feeding - bulls

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Virginia, Front Royal State

| Location | F. R. | F. R. | F. R. | F. R. | F. R. | F. R. |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Angus | Angus | Angus | Hereford | Hereford |
| Breed of dam | Angus | Angus | Angus | Angus | Hereford | Hereford |
| Line or group[1] | 1803-A7 | 0201-A8 | 1575-A8 | 8150-A9 | 0125-H2 | Unknown |
| No. cows exposed | 16 | 28 | 13 | 1 | 17 | 1 |
| No. calves born[3] | 15 | 24 | 11 | 1 | 13 | 1 |
| Calving percent, born | 93.8 | 85.7 | 84.6 | 100.0 | 76.5 | 100.0 |
| Av. birth date | 2-15-63 | 2-13-63 | 2-12-63 | 4-02-63 | 3-09-63 | 8-20-62 |
| Av. birth wt. | 65 | 65 | 58 | 67 | 63 | 63 |
| No. calves weaned | 15 | 21 | 7 | 1 | 9 | 0 |
| Calving percent, weaned[4] | 93.8 | 75.0 | 53.8 | 100.0 | 52.9 | 0 |
| Av. weaning age, days | 213 | 212 | 202 | 189 | 184 | |
| Adj. ADG[5] | 1.82 | 1.91 | 2.00 | 1.82 | 1.42 | |
| Av. type sc.[6] | 12.0 | 11.2 | 12.9 | 12.6 | 10.0 | |
| Av. cond. sc.[6] | 10.0 | 8.8 | 9.0 | 9.8 | 8.2 | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

Age of dam, season of birth, sex of calf, and creep feeding - bulls.

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Virginia, Front Royal State

| Location | F. R. | F. R. | F. R. | F. R. | F. R. | F. R. |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Hereford | Hereford | Hereford | Hereford | Hereford |
| Breed of dam | Hereford | Hereford | Hereford | Hereford | Hereford | Hereford |
| Line or group[1] | 0079-H3 | 0069-H4 | 0811-H5 | 1806-H6 | 1560-H7 | 1870-H8 |
| No. cows exposed[2] | 16 | 20 | 62 | 9 | 13 | 17 |
| No. calves born[3] | 13 | 13 | 45 | 4 | 11 | 12 |
| Calving percent, born | 81.2 | 65.0 | 72.6 | 44.4 | 84.6 | 70.6 |
| Av. birth date | 2-17-63 | 3-17-63 | 1-30-63 | 2-13-63 | 3-03-63 | 2-21-63 |
| Av. birth wt. | 62 | 60 | 68 | 64 | 66 | 73 |
| No. calves weaned | 10 | 11 | 43 | 4 | 9 | 9 |
| Calving percent, weaned[4] | 62.5 | 55.0 | 69.4 | 44.4 | 69.2 | 52.9 |
| Av. weaning age, days | 208 | 182 | 228 | 215 | 191 | 208 |
| Adj. ADG[5] | 1.78 | 1.77 | 1.75 | 1.75 | 1.81 | 1.78 |
| Av. type sc.[6] | 10.8 | 11.6 | 12.2 | 13.1 | 12.4 | 12.2 |
| Av. cond. sc.[6] | 8.8 | 8.6 | 9.4 | 9.8 | 9.2 | 9.4 |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

Age of dam, season of birth, sex of calf, and creep feeding - bulls

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Virginia, Front Royal State

| Location | F. R. | F. R. | F. R. | F. R. | F. R. | |
|---|---|---|---|---|---|---|
| Breed of sire | Shorthorn | Shorthorn | Shorthorn | Shorthorn | Shorthorn | |
| Breed of dam | Shorthorn | Shorthorn | Shorthorn | Shorthorn | Shorthorn | |
| Line or group[1] | 885-S1 | 1392-S2 | 9158-S4 | 114-S5 | 0815-S7 | |
| No. cows exposed[2] | 18 | 15 | 18 | 17 | 24 | |
| No. calves born[3] | 12 | 12 | 11 | 13 | 20 | |
| Calving percent, born | 66.7 | 80.0 | 61.1 | 76.5 | 83.3 | |
| Av. birth date | 3-03-63 | 3-09-63 | 2-25-63 | 2-23-63 | 2-24-63 | |
| Av. birth wt. | 70 | 66 | 65 | 70 | 70 | |
| No. calves weaned | 7 | 10 | 8 | 9 | 16 | |
| Calving percent, weaned[4] | 38.9 | 66.7 | 44.4 | 52.9 | 66.7 | |
| Av. weaning age, days | 192 | 191 | 205 | 205 | 206 | |
| Adj. ADG[5] | 1.77 | 1.61 | 1.68 | 1.58 | 1.80 | |
| Av. type sc.[6] | 11.6 | 10.9 | 11.4 | 12.0 | 13.5 | |
| Av. cond. sc.[6] | 9.0 | 8.0 | 8.3 | 8.5 | 10.0 | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

Age of dam, season of birth, sex of calf, and creep feeding - bulls

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

Virginia, Front Royal State

| Location | F. R. | F. R. | F. R. | F. R. | | |
|---|---|---|---|---|---|---|
| Breed of sire | Shorthorn | Shorthorn | Shorthorn | Various | | |
| Breed of dam | Shorthorn | Shorthorn | Shorthorn | Various | | |
| Line or group[1] | 1814-S7 | 0076-S8 | 1549-S8 | Crossbred | | |
| No. cows exposed[2] | 10 | 20 | 24 | 29 | | |
| No. calves born[3] | 6 | 18 | 14 | 24 | | |
| Calving percent, born | 60.0 | 90.0 | 58.3 | 82.8 | | |
| Av. birth date | 2-23-63 | 2-22-63 | 2-12-63 | 3-03-63 | | |
| Av. birth wt. | 74 | 67 | 69 | 70 | | |
| No. calves weaned | 5 | 16 | 11 | 22 | | |
| Calving percent, weaned[4] | 50.0 | 80.0 | 45.8 | 75.9 | | |
| Av. weaning age, days | 206 | 204 | 216 | 194 | | |
| Adj. ADG[5] | 1.70 | 1.57 | 1.79 | 2.00 | | |
| Av. type sc.[6] | 13.0 | 11.8 | 12.0 | 12.0 | | |
| Av. cond. sc.[6] | 9.9 | 9.0 | 9.2 | 9.9 | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

Age of dam, season of birth, sex of calf, and creep feeding - bulls

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium

# FORM II
# POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Virginia, Front Royal State

| | Location | F. R. | F. R. | F. R. | F. R. | F. R. | F. R. |
|---|---|---|---|---|---|---|---|
| | Breed of sire | Angus | Angus | Angus | Angus | Angus | Angus |
| | Breed of dam | Angus | Angus | Angus | Angus | Angus | Angus |
| | Line or group[1] | 0198-A1 | 8184-A1 | 1119-A2 | 0218-A2 | 8150-A3 | 210-A4 |
| Bulls | No. in group | 2 | 1 | 1 | 1 | 1 | 1 |
| | Av. init. wt. | 240 | 225 | 252 | 167 | 230 | 227 |
| | Av. init. wt. | 554 | 442 | 574 | 450 | 553 | 596 |
| | Av.no.da.fed | 168 | 168 | 168 | 168 | 168 | 168 |
| | Av. final wt. | 931 | 811 | 974 | 828 | 988 | 1009 |
| | ADG on test | 2.25 | 2.20 | 2.38 | 2.25 | 2.59 | 2.46 |
| | Av. type sc. | 11.8 | 10.4 | 12.2 | 11.6 | 12.2 | 12.2 |
| | Av. inbreeding | 0.21 | 0.30 | 0.25 | 0.38 | 0.19 | 0.19 |
| Heifers | No. in group | 2 | 2 | 1 | 4 | 2 | 4 |
| | Av. init. age | 269 | 268 | 284 | 246 | 250 | 224 |
| | Av. init. wt. | 476 | 390 | 424 | 384 | 427 | 352 |
| | Av.no.da.fed | 140 | 140 | 140 | 140 | 140 | 140 |
| | Av. final wt. | 640 | 576 | 658 | 581 | 598 | 566 |
| | ADG on test | 1.17 | 1.33 | 1.67 | 1.40 | 1.22 | 1.53 |
| | Av. type sc. | 12.5 | 11.9 | 14.0 | 12.2 | 10.9 | 11.6 |
| | Av. cond. sc. | 8.7 | 8.6 | 9.6 | 8.7 | 7.7 | 8.2 |
| | Av. inbreeding | 0.22 | 0.32 | 0.38 | 0.24 | 0.28 | 0.24 |
| Steers | No. in group | 1 | 2 | 1 | 2 | | |
| | Av. init. age | 278 | 203 | 270 | 228 | | |
| | Av. init. wt. | 625 | 324 | 503 | 422 | | |
| | Av.no.da.fed | 196 | 196 | 196 | 196 | | |
| | Av. final wt. | 1070 | 639 | 854 | 802 | | |
| | ADG on test | 2.27 | 1.60 | 1.79 | 1.94 | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc.[a] | 12.3 | 10.2 | 12.0 | 12.5 | | |
| | Av. inbreeding | 0.25 | 0.28 | 0.38 | 0.28 | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | Full-fed | Limited | Full-fed |
| Pounds/day over feeding period | 21.0/head | 6.0/head | 20.0/head |
| Ration: | All animals fed the same ration. | | |

150 lbs. molasses
1050 lbs. corn
275 lbs. protein supplement
275 lbs. alfalfa
250 lbs. orchard grass

In addition, bulls had access to 1 lb. of loose hay per head per day, heifers received all the corn silage and loose hay they would clean up, and steers were fed loose hay ad lib.

[a] Slaughter grade.

FORM II
POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Virginia, Front Royal State

| | Location | F. R. | F. R. | F. R. | F. R. | F. R. | F. R. |
|---|---|---|---|---|---|---|---|
| | Breed of sire | Angus | Angus | Angus | Angus | Angus | Hereford |
| | Breed of dam | Angus | Angus | Angus | Angus | Angus | Hereford |
| | Line or group[1] | 0808-A7 | 9811-A7 | 0201-A8 | 9802-A8 | Purchased | 0125-H2 |
| Bulls | No. in group | 2 | 1 | 2 | 2 | 3 | 1 |
| | Av. init. age. | 224 | 235 | 231 | 222 | 210 | 169 |
| | Av. init. wt. | 530 | 547 | 575 | 560 | 541 | 340 |
| | Av.no.da.fed | 168 | 168 | 168 | 168 | 168 | 168 |
| | Av. final wt. | 952 | 965 | 986 | 994 | 1004 | 737 |
| | ADG on test | 2.52 | 2.49 | 2.45 | 2.58 | 2.75 | 2.36 |
| | Av. type sc. | 12.1 | 12.8 | 11.5 | 11.6 | 12.8 | 10.2 |
| | Av. cond. sc. | 11.1 | 12.0 | 11.0 | 10.7 | 11.5 | 9.2 |
| | Av. inbreeding | 0 | 0.01 | 0.01 | 0 | 0 | 0.16 |
| Heifers | No. in group | 5 | 3 | 10 | 3 | | 1 |
| | Av. init. age | 259 | 252 | 258 | 256 | | 233 |
| | Av. init. wt. | 414 | 423 | 482 | 440 | | 358 |
| | Av.no.da.fed | 140 | 140 | 140 | 140 | | 140 |
| | Av. final wt. | 584 | 613 | 685 | 636 | | 518 |
| | ADG on test | 1.21 | 1.35 | 1.46 | 1.40 | | 1.14 |
| | Av. type sc. | 12.6 | 11.3 | 11.7 | 12.6 | | 10.8 |
| | Av. cond. sc. | 8.4 | 7.9 | 8.5 | 9.3 | | 7.0 |
| | Av. inbreeding | 0 | 0.01 | 0.02 | 0 | | 0.25 |
| Steers | No. in group | 3 | 3 | 3 | 3 | | |
| | Av. init. age. | 254 | 270 | 251 | 255 | | |
| | Av. init. wt. | 457 | 490 | 505 | 451 | | |
| | Av.no.da.fed | 196 | 196 | 196 | 196 | | |
| | Av. final wt. | 892 | 886 | 915 | 847 | | |
| | ADG on test | 2.22 | 2.02 | 2.09 | 2.02 | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc.[a] | 12.9 | 13.4 | 11.3 | 13.0 | | |
| | Av. inbreeding | 0 | 0.01 | 0.11 | 0 | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | Full-fed | Limited | Full-fed |
| Pounds/day over feeding period | 21.0/head | 6.0/head | 20.0/head |
| | All animals fed the same ration. | | |
| Ration: | 150 lbs. molasses<br>1050 lbs. corn<br>275 lbs. protein supplement<br>275 lbs. alfalfa<br>250 lbs. orchard grass<br>In addition, bulls had access to 1 lb. of loose hay per head per day, heifers received all the corn silage and loose hay they would clean up, and steers were fed loose hay ad lib. | | |

[a] Slaughter grade.

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Virginia, Front Royal State

| Location | | F. R. | F. R. | F. R. | F. R. | F. R. | F. R. |
|---|---|---|---|---|---|---|---|
| Breed of sire | | Hereford | Hereford | Hereford | Hereford | Hereford | Hereford |
| Breed of dam | | Hereford | Hereford | Hereford | Hereford | Hereford | Hereford |
| Line or group[1] | | 322-H2 | 8801-H4 | 0811-H5 | 0059-H6 | 0812-H7 | 0079-H8 |
| Bulls | No. in group | 1 | 2 | 4 | | 1 | 1 |
| | Av. init. age | 188 | 204 | 210 | | 208 | 231 |
| | Av. init. wt. | 268 | 438 | 511 | | 482 | 500 |
| | Av.no.da.fed | 168 | 168 | 168 | | 168 | 168 |
| | Av. final wt. | 616 | 826 | 920 | | 878 | 940 |
| | ADG on test | 2.07 | 2.30 | 2.44 | | 2.36 | 2.62 |
| | Av. type sc. | 9.6 | 11.0 | 12.0 | | 13.4 | 11.0 |
| | Av. cond. sc. | 8.8 | 10.3 | 10.6 | | 12.0 | 10.8 |
| | Av. inbreeding | 0.25 | 0.12 | 0 | | 0 | 0.13 |
| Heifers | No. in group | 1 | 2 | 25 | 2 | 1 | 5 |
| | Av. init. age | 190 | 196 | 260 | 257 | 229 | 225 |
| | Av. init. wt. | 255 | 386 | 427 | 345 | 271 | 367 |
| | Av.no.da.fed | 140 | 140 | 140 | 140 | 140 | 140 |
| | Av. final wt. | 455 | 525 | 593 | 532 | 365 | 560 |
| | ADG on test | 1.43 | 0.99 | 1.18 | 1.34 | 0.67 | 1.38 |
| | Av. type sc. | 10.2 | 12.0 | 12.3 | 11.6 | 10.4 | 10.4 |
| | Av. cond. sc. | 7.4 | 8.1 | 8.5 | 7.5 | 6.4 | 7.5 |
| | Av. inbreeding | 0.25 | 0 | 0 | 0 | 0 | 0.12 |
| Steers | No. in group | | | 3 | | 3 | |
| | Av. init. age | | | 239 | | 243 | |
| | Av. init. wt. | | | 435 | | 374 | |
| | Av.no.da.fed | | | 196 | | 196 | |
| | Av. final wt. | | | 801 | | 783 | |
| | ADG on test | | | 1.86 | | 2.09 | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc.[a] | | | 11.7 | | 11.9 | |
| | Av. inbreeding | | | 0 | | 0 | |

1 - Show whether station or cooperator owned, in addition to other group designation.

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full. limited, etc. | Full-fed | Limited | Full-fed |
| Pounds/day over feeding period | 21.0/head | 6.0/head | 20.0/head |

Ration: All animals fed the same ration.

150 lbs. molasses
1050 lbs. corn
275 lbs. protein supplement
275 lbs. alfalfa
250 lbs. orchard grass

In addition, bulls had access to 1 lb. of loose hay per head per day, heifers received all the corn silage and loose hay they would clean up, and steers were fed loose hay ad lib.

[a]Slaughter grade.

FORM II
POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Virginia, Front Royal State

| | Location | F. R. | F. R. | F. R. | F. R. | F. R. | F. R. |
|---|---|---|---|---|---|---|---|
| | Breed of sire | Hereford | Shorthorn | Shorthorn | Shorthorn | Shorthorn | Shorthorn |
| | Breed of dam | Hereford | Shorthorn | Shorthorn | Shorthorn | Shorthorn | Shorthorn |
| | Line or group[1] | Purchased | 8290-S2 | 0211-S1 | 885-S1 | 1392-S2 | 287-S4 |
| Bulls | No. in group | 4 | 1 | 1 | 1 | | 1 |
| | Av. init. age | 232 | 205 | 224 | 224 | | 180 |
| | Av. init. wt. | 559 | 524 | 501 | 497 | | 347 |
| | Av.no.da.fed | 168 | 168 | 168 | 168 | | 168 |
| | Av. final wt. | 935 | 971 | 927 | 956 | | 801 |
| | ADG on test | 2.24 | 2.66 | 2.53 | 2.73 | | 2.70 |
| | Av. type sc. | 13.0 | 9.6 | 9.8 | 11.0 | | 12.6 |
| | Av. cond. sc. | 11.8 | 9.2 | 9.0 | 9.8 | | 10.6 |
| | Av. inbreeding | 0.01 | 0.28 | 0.38 | 0.28 | | 0.38 |
| Heifers | No. in group | | 2 | 3 | 3 | 2 | |
| | Av. init. age | | 254 | 250 | 246 | 228 | |
| | Av. init. wt. | | 413 | 386 | 449 | 267 | |
| | Av.no.da.fed | | 140 | 140 | 140 | 140 | |
| | Av. final wt. | | 599 | 570 | 639 | 491 | |
| | ADG on test | | 1.33 | 1.32 | 1.35 | 1.60 | |
| | Av. type sc. | | 11.7 | 10.3 | 10.4 | 12.2 | |
| | Av. cond. sc. | | 8.4 | 7.5 | 7.5 | 7.6 | |
| | Av. inbreeding | | 0.33 | 0.39 | 0.38 | 0.49 | |
| Steers | No. in group | | 3 | 2 | 1 | | 1 |
| | Av. init. age | | 234 | 270 | 282 | | 215 |
| | Av. init. wt. | | 393 | 400 | 369 | | 368 |
| | Av.no.da.fed | | 196 | 196 | 196 | | 196 |
| | Av. final wt. | | 874 | 864 | 759 | | 723 |
| | ADG on test | | 2.46 | 2.36 | 1.99 | | 1.81 |
| | Av. type sc. | | | | | | |
| | Av. cond. sc.[a] | | 12.2 | 11.0 | 10.3 | | 11.7 |
| | Av. inbreeding | | 0.30 | 0.41 | 0.40 | | 0.25 |

1 - Show whether station or cooperator owned, in addition to other group designation.

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | Full-fed | Limited | Full-fed |
| Pounds/day over feeding period | 21.0/head | 6.0/head | 20.0/head |

Ration: All animals fed the same ration.
150 lbs. molasses
1050 lbs. corn
275 lbs. protein supplement
275 lbs. alfalfa
250 lbs. orchard grass
In addition, bulls had access to 1 lb. of loose hay per head per day, heifers received all the corn silage and loose hay they would clean up, and steers were fed loose hay ad lib.

[a]Slaughter grade.

# FORM II
## POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Virginia, Front Royal State

| | Location | F. R. | F. R. | F. R. | F. R. | | |
|---|---|---|---|---|---|---|---|
| | Breed of sire | Shorthorn | Shorthorn | Shorthorn | Shorthorn | | |
| | Breed of dam | Shorthorn | Shorthorn | Shorthorn | Shorthorn | | |
| | Line or group[1] | 9158-S4 | 114-S5 | 0189-S5 | 0185-S7 | | |
| Bulls | No. in group | 1 | 1 | 1 | 1 | | |
| | Av. init. age | 212 | 209 | 167 | 243 | | |
| | Av. init. wt. | 415 | 388 | 374 | 491 | | |
| | Av.no.da.fed | 168 | 168 | 168 | 168 | | |
| | Av. final wt. | 830 | 771 | 788 | 877 | | |
| | ADG on test | 2.47 | 2.28 | 2.46 | 2.30 | | |
| | Av. type sc. | 11.4 | 11.0 | 11.4 | 14.0 | | |
| | Av. cond. sc. | 10.0 | 9.6 | 10.0 | 12.8 | | |
| | Av. inbreeding | 0.38 | 0.25 | 0.19 | 0 | | |
| Heifers | No. in group | 3 | 6 | | 4 | | |
| | Av. init. age | 266 | 243 | | 271 | | |
| | Av. init. wt. | 500 | 383 | | 403 | | |
| | Av.no.da.fed | 140 | 140 | | 140 | | |
| | Av. final wt. | 675 | 552 | | 610 | | |
| | ADG on test | 1.25 | 1.21 | | 1.48 | | |
| | Av. type sc. | 12.7 | 11.9 | | 13.8 | | |
| | Av. cond. sc. | 8.7 | 8.2 | | 9.4 | | |
| | Av. inbreeding | 0.19 | 0.25 | | | | |
| Steers | No. in group | 2 | | | | | |
| | Av. init. age | 248 | | | | | |
| | Av. init. wt. | 400 | | | | | |
| | Av.no.da.fed | 196 | | | | | |
| | Av. final wt. | 770 | | | | | |
| | ADG on test | 1.88 | | | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc.[a] | 11.6 | | | | | |
| | Av. inbreeding | 0.19 | | | | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | Full-fed | Limited | Full-fed |
| Pounds/day over feeding period | 21.0/head | 6.0/head | 20.0/head |

Ration: All animals fed the same ration.

150 lbs. molasses
1050 lbs. corn
275 lbs. protein supplement
275 lbs. alfalfa
250 lbs. orchard grass

In addition, bulls had access to 1 lb. of loose hay per head per day, heifers received all the corn silage and loose hay they would clean up, and steers were fed loose hay ad lib.

[a]Slaughter grade.

FORM II
POSTWEANING PERFORMANCE OF CALVES FED IN 1963

Virginia, Front Royal State

| | Location | F. R. | F. R. | F. R. | F. R. | F. R. | |
|---|---|---|---|---|---|---|---|
| | Breed of sire | Shorthorn | Shorthorn | Shorthorn | Shorthorn | Various | |
| | Breed of dam | Shorthorn | Shorthorn | Shorthorn | Shorthorn | Various | |
| | Line or group | 9807-S7 | 0076-S8 | 9805-S8 | Purchased | Crossbred | |
| Bulls | No. in group | 2 | 1 | 3 | 2 | 8 | |
| | Av. init. age | 206 | 180 | 214 | 229 | 216 | |
| | Av. init. wt. | 524 | 462 | 506 | 536 | 523 | |
| | Av.no.da.fed | 168 | 168 | 168 | 168 | 168 | |
| | Av. final wt. | 978 | 1013 | 954 | 946 | 967 | |
| | ADG on test | 2.64 | 3.28 | 2.67 | 2.44 | 2.64 | |
| | Av. type sc. | 13.4 | 10.4 | 13.7 | 14.3 | 12.0 | |
| | Av. cond. sc. | 11.7 | 10.4 | 12.1 | 12.2 | 11.6 | |
| | Av. inbreeding | 0 | 0.07 | 0 | 0 | | |
| Heifers | No. in group | 8 | 6 | 14 | | | |
| | Av. init. age | 243 | 252 | 259 | | | |
| | Av. init. wt. | 433 | 385 | 449 | | | |
| | Av.no.da.fed | 140 | 140 | 140 | | | |
| | Av. final wt. | 638 | 629 | 656 | | | |
| | ADG on test | 1.46 | 1.74 | 1.48 | | | |
| | Av. type sc. | 11.8 | 11.4 | 12.6 | | | |
| | Av. cond. sc. | 8.4 | 8.5 | 8.7 | | | |
| | Av. inbreeding | 0 | 0.05 | 0 | | | |
| Steers | No. in group | 3 | 3 | | | | |
| | Av. init. age | 246 | 253 | | | | |
| | Av. init. wt. | 470 | 399 | | | | |
| | Av.no.da.fed | 196 | 196 | | | | |
| | Av. final wt. | 915 | 816 | | | | |
| | ADG on test | 2.27 | 2.13 | | | | |
| | Av. type sc. | | | | | | |
| | Av. cond. sc.[a] | 12.9 | 11.2 | | | | |
| | Av. inbreeding | 0 | 0.07 | | | | |

1 - Show whether station or cooperator owned, in addition to other group designation.

| Feed regime: | Bulls | Heifers | Steers |
|---|---|---|---|
| How fed - full, limited, etc. | Full-fed | Limited | Full-fed |
| Pounds/day over feeding period | 21.0/head | 6.0/head | 20.0/head |

Ration: All animals fed the same ration.

150 lbs. molasses
1050 lbs. corn
275 lbs. protein supplement
275 lbs. alfalfa
250 lbs. orchard grass

In addition, bulls had access to 1 lb. of loose hay per head per day, heifers received all the corn silage and loose hay they would clean up, and steers were fed loose hay ad lib.

[a]Slaughter grade.

FORM III
SLAUGHTER DATA, 1963

Virginia, Front Royal State

| Location | F. R. | F. R. | F. R. | F. R. | F. R. | F. R. |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Angus | Angus | Angus | Angus | Angus |
| Breed of dam | Angus | Angus | Angus | Angus | Angus | Angus |
| Line or group | 0198-A1 | 8184-A1 | 57-A2 | 0218-A2 | 0808-A7 | 9811-A7 |
| Sex | Steer | Steer | Steer | Steer | Steer | Steer |
| Age at slaughter | 479 | 418 | 471 | 436 | 462 | 474 |
| No. slaughtered | 1 | 2 | 1 | 2 | 3 | 3 |
| Days in feedlot | 196 | 196 | 196 | 196 | 196 | 196 |
| Final feedlot weight | 1070 | 639 | 854 | 802 | 892 | 886 |
| Slaughter wt., live | 1000 | 639 | 822 | 784 | 884 | 869 |
| Carcass weight, cold | 600 | 369 | 494 | 464 | 527 | 529 |
| Dressing percent, cold | 60.0 | 57.7 | 60.0 | 59.1 | 59.6 | 60.8 |
| Carcass grade, quality | 11.0 | 11.5 | 11.0 | 10.5 | 12.0 | 11.7 |
| Carcass grade, cutability[a] | 44.3 | 44.6 | 45.5 | 44.8 | 44.5 | 44.6 |
| Est. percent, kidney fat | | | | | | |
| Rib-eye area/100 lbs. car.(sq.in.) | 1.60 | 1.93 | 2.00 | 2.18 | 2.11 | 2.37 |
| Marbling score, USDA | | | | | | |
| Fat thickness over ribeye(in.)[1] | 0.59 | 0.48 | 0.67 | 0.52 | 0.36 | 0.52 |
| W-B shear force, lbs.[2] | | | | | | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

[a]Weight of rib, short loin, round, loin end, and rump; divided by cold carcass weight.

FORM III
SLAUGHTER DATA, 1963

Virginia, Front Royal State

| Location | F. R. | F. R. | F. R. | F. R. | F. R. | |
|---|---|---|---|---|---|---|
| Breed of sire | Angus | Angus | Hereford | Hereford | Shorthorn | |
| Breed of dam | Angus | Angus | Hereford | Hereford | Shorthorn | |
| Sex | Steers | Steers | Steers | Steers | Steers | |
| Age at slaughter | 455 | 463 | 447 | 454 | 466 | |
| No. slaughtered | 3 | 3 | 3 | 3 | 3 | |
| Days in feedlot | 196 | 196 | 196 | 196 | 196 | |
| Final feedlot weight | 915 | 847 | 801 | 783 | 816 | |
| Slaughter wt., live | 908 | 823 | 794 | 780 | 793 | |
| Carcass weight, cold | 526 | 508 | 469 | 465 | 489 | |
| Dressing percent, cold | 57.9 | 61.7 | 59.0 | 59.6 | 61.6 | |
| Carcass grade, cutability[a] | 44.5 | 45.7 | 47.1 | 46.1 | 46.0 | |
| Est. percent, kidney fat | | | | | | |
| Rib-eye area/100 lbs.car.(sq.in.) | 2.03 | 1.97 | 2.24 | 2.23 | 1.98 | |
| Marbling score, USDA | | | | | | |
| Fat thickness over ribeye(in.)[1] | 0.52 | 0.70 | 0.58 | 0.44 | 0.62 | |
| W-B shear force, lbs.[2] | | | | | | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

[a]Weight of rib, short loin, round, loin end, and rump; divided by cold carcass weight.

FORM III
SLAUGHTER DATA, 1963

Virginia, Front Royal State

| Location | F. R. | F. R. | F. R. | F. R. | F. R. | F. R. |
|---|---|---|---|---|---|---|
| Breed of sire | Shorthorn | Shorthorn | Shorthorn | Shorthorn | Shorthorn | Shorthorn |
| Breed of dam | Shorthorn | Shorthorn | Shorthorn | Shorthorn | Shorthorn | Shorthorn |
| Line or group | 0211-S1 | 885-S1 | 8290-S2 | 287-S4 | 9158-S4 | 9807-S7 |
| Sex | Steers | Steers | Steers | Steers | Steers | Steers |
| Age at slaughter | 481 | 497 | 444 | 430 | 459 | 450 |
| No. slaughtered | 2 | 1 | 3 | 1 | 2 | 3 |
| Days in feedlot | 196 | 196 | 196 | 196 | 196 | 196 |
| Final feedlot weight | 864 | 759 | 874 | 723 | 770 | 915 |
| Slaughter wt., live | 850 | 772 | 863 | 720 | 782 | 890 |
| Carcass weight, cold | 513 | 460 | 511 | 440 | 471 | 544 |
| Dressing percent, cold | 60.3 | 59.5 | 59.2 | 61.1 | 60.2 | 61.1 |
| Carcass grade, quality | 10.0 | 11.0 | 10.7 | 11.0 | 12.0 | 12.3 |
| Carcass grade, cutability[a] | 45.1 | 45.7 | 44.1 | 44.7 | 45.4 | 44.7 |
| Est. percent, kidney fat | | | | | | |
| Rib-eye area/100 lbs. car. (sq. in.) | 1.77 | 1.84 | 1.58 | 1.77 | 1.89 | 1.84 |
| Marbling score, USDA | | | | | | |
| Fat thickness over ribeye(in.)[1] | 0.55 | 0.52 | 0.62 | 0.68 | 0.58 | 0.54 |
| W-B shear force, lbs.[2] | | | | | | |

1 - Use one measure; if not, indicate method.

2 - Indicate size of core used and how meat was cooked.

[a] Weight of rib, short loin, round, loin end, and rump; divided by cold carcass weight.

WEST VIRGINIA UNIVERSITY
Agricultural Experiment Station

No written report was submitted by this station for 1963-1964, as the Hatch 90 project, which was the S-10 contributing project from West Virginia, has been closed out and no new project has yet been initiated to replace it.

Submitted by: H. E. Kidder

FORM I
COW PRODUCTION, 1963 CALF CROP (1962-1963)

West Virginia State

| Location | Morgantown | Morgantown | Wardens-ville | | | |
|---|---|---|---|---|---|---|
| Breed of sire | Hereford | Angus | Hereford | | | |
| Breed of dam | Hereford | Angus | Hereford | | | |
| Line or group[1] | | | | | | |
| No. cows exposed[1] | 41 | 34 | 103 | | | |
| No. calves born[2] | 38 | 33 | 93 | | | |
| Calving per-cent, born[3] | 92.7 | 97.1 | 90.3 | | | |
| Av. birth date | 1-20-63 | 2-20-63 | 3-05-63 | | | |
| Av. birth wt. | | | | | | |
| No. calves weaned | 37 | 28 | 68 | | | |
| Calving per-cent, weaned[4] | 90.2 | 82.3 | 66.0 | | | |
| Av. weaning age, days | 197 | 163 | 142 | | | |
| Adj. ADG[5] | 1.67 | 1.66 | 1.37 | | | |
| Av. type sc.[6] | 11 | 11 | 10 | | | |
| Av. cond. sc.[6] | | | | | | |

1 - Purebreds, grade, line, backcross, three-breed cross, treatment, etc.
2 - Total number put in breeding herd.
3 - Total number born, dead + alive.
4 - Number weaned, divided by number of cows exposed.
5 - Indicate adjustments:

6 - 15-17 = Fancy
12-14 = Choice
9-11 = Good
6-8 = Medium